

FBISD BP030 WILLOWRIDGE HIGH SCHOOL FINE ARTS ADDITION AND RENOVATION

2023306

ISSUE FOR BID AND PERMIT

16 SEPTEMBER 2025

Kirksey
ARCHITECTURE

Houston + Austin + Dallas

(C) – authored by Civil Engineer
(S) – authored by Structural Engineer
(A) – authored by Architect
(MEP) – authored by MEP Engineer
(O) – authored by Owner
(TR) – authored by Theatre Consultant
(T) – authored by Technology

SECTION 00 01 02 - TABLE OF CONTENTS

SECTIONS		ISSUE DATE	REVISED
COVER & TABLE OF CONTENTS			
00 01 01	COVER PAGE	16 SEP 2025	
00 01 02	TABLE OF CONTENTS	16 SEP 2025	
DIVISION 00 — PROCUREMENT AND CONTRACTING REQUIREMENTS			
00 01 07.1	ARCHITECT SEAL PAGE (A)	16 SEP 2025	
00 01 07.2	CIVIL SEAL PAGE (C)	16 SEP 2025	
00 01 07.4	STRUCTURAL SEAL PAGE (S)	16 SEP 2025	
00 01 07.5	MEP SEAL PAGE (MEP)	16 SEP 2025	
00 01 07.7	TECHNOLOGY SEAL PAGE (T)	16 SEP 2025	
00 11 16	CSP 26-006AL ADVERTISING REQUEST DOCUMENT (O)	16 SEP 2025	
00 20 00	CSP INSTRUCTION TO BIDDERS (O)	16 SEP 2025	
00 20 01	INSTRUCTIONS FOR CSP PACKAGE B BASE BID ADJUSTMENT (O)	16 SEP 2025	
00 20 18	CONFLICT OF INTEREST QUESTIONAIRE FORMS (O)	16 SEP 2025	
00 20 20	CSP REQUIRED FORMS 2024 (O)	16 SEP 2025	
00 31 13.13	BP030 PHASING SCHEDULE - TEXT (O)	16 SEP 2025	
00 31 13.16	BP030 PHASING SCHEDULE - GANTT (O)	16 SEP 2025	
00 31 26	EXISTING HAZARDOUS MATERIAL INFORMATION (A)	16 SEP 2025	
00 31 26.13	ASBESTOS REPORT (O)	16 SEP 2025	
00 31 32	GEOTECHNICAL DATA	16 SEP 2025	
00 31 32.13	GEOTECHNICAL REPORT (O)	16 SEP 2025	
00 40 10	FORT BEND ISD MINIMUM INSURANCE REQUIREMENTS (O)	16 SEP 2025	
00 40 12	BONDING CAPACITY LETTER 2024 (O)	16 SEP 2025	
00 40 18	GENERAL PROVISIONS REV 1 (O)	16 SEP 2025	
00 40 20	DEVIATIONS REQUEST FORM (O)	16 SEP 2025	
00 42 01	PACKAGE A PROPOSAL FORM - CSP STIPULATED SUM (O)	16 SEP 2025	
00 42 02	PACKAGE B ALTERNATE PROPOSAL FORM - CSP STIPULATED SUM (O)	16 SEP 2025	
00 70 00	AIA AGREEMENT DOCUMENT A101-2017 (O)	16 SEP 2025	
00 70 01	AIA AGREEMENT DOCUMENT A201-2017 (O)	16 SEP 2025	
DIVISION 01 — GENERAL REQUIREMENTS			
01 10 00	SUMMARY OF WORK (O)	16 SEP 2025	
01 14 13	CONTRACTOR IDENTIFICATION CERTIFICATION OF COMPLIANCE (O)	16 SEP 2025	
01 21 00	ALLOWANCES (O)	16 SEP 2025	
01 22 00	UNIT PRICES (O)	16 SEP 2025	
01 23 00	ALTERNATES	16 SEP 2025	
01 25 00	SUBSTITUTION PROCEDURES (O)	16 SEP 2025	
01 26 00	CONTRACT MODIFICATIONS (O)	16 SEP 2025	
01 29 00	PAYMENT PROCEDURES (O)	16 SEP 2025	
01 29 73	SCHEDULE OF VALUES (O)	16 SEP 2025	
01 31 00	PROJECT MANAGEMENT AND COORDINATION (O)	16 SEP 2025	
01 31 13	PROJECT COORDINATION (O)	16 SEP 2025	
01 31 20.01	SUBCONTRACTOR-SUBCONSULTANT UTILIZATION REPORT (O)	16 SEP 2025	
01 31 20.02	SUBCONTRACTOR-SUBCONSULTANT-SUPPLIERS FORM (O)	16 SEP 2025	
01 32 00	CONSTRUCTION PROGRESS DOCUMENTATION (O)	16 SEP 2025	
01 32 16	CONSTRUCTION PROGRESS SCHEDULE (O)	16 SEP 2025	
01 32 33	PHOTOGRAPHIC DOCUMENTATION (O)	16 SEP 2025	
01 33 00	SUBMITTAL PROCEDURES (O)	16 SEP 2025	
01 35 23	PROJECT SAFETY AND LOSS PREVENTION (O)	16 SEP 2025	
01 40 00	QUALITY REQUIREMENTS (O)	16 SEP 2025	
01 42 00	REFERENCES (O)	16 SEP 2025	
01 45 23	TESTING AND INSPECTION SERVICES (S)	16 SEP 2025	
01 45 23.01	HVAC TEST ADJUST AND BALANCE (O)	16 SEP 2025	
01 45 23.02	TESTING AND INSPECTION SERVICES (O)	16 SEP 2025	
01 50 00	TEMPORARY FACILITIES AND CONTROLS (O)	16 SEP 2025	

01 52 14 TEMPORARY FACILITIES FOR STUDENTS (O) ..... 16 SEP 2025
01 55 26 TRAFFIC CONTROL (O) ..... 16 SEP 2025
01 56 39 TEMPORARY TREE AND PLANT PROTECTION (O) ..... 16 SEP 2025
01 57 10 TPDES REQUIREMENTS (O) ..... 16 SEP 2025
01 57 13 EROSION AND SEDIMENTATION CONTROL (C) ..... 16 SEP 2025
01 57 19 CONTROL OF GROUND SURFACE WATER (O) ..... 16 SEP 2025
01 57 21 INDOOR AIR QUALITY CONTROLS (O) ..... 16 SEP 2025
01 60 00 PRODUCT REQUIREMENTS (O) ..... 16 SEP 2025
01 61 16 VOLATILE ORGANIC COMPOUND VOC CONTENT RESTRICTIONS (O) ..... 16 SEP 2025
01 73 00 EXECUTION (O) ..... 16 SEP 2025
01 77 00 CLOSEOUT PROCEDURES (O) ..... 16 SEP 2025
01 77 00.02 CLOSEOUT PROCEDURE GC CHECKLIST (O) ..... 16 SEP 2025
01 77 00.03 FINAL PAYMENT - CONDITIONAL WAIVER RELEASE (O) ..... 16 SEP 2025
01 77 00.04 FINAL PAYMENT - UNCONDITIONAL WAIVER RELEASE (O) ..... 16 SEP 2025
01 77 00.05 WARRANTY LETTER (O) ..... 16 SEP 2025
01 77 00.06 ASBESTOS FREE CONTRACTOR FORM (O) ..... 16 SEP 2025
01 77 00.07 LEAD FREE FORM (O) ..... 16 SEP 2025
01 77 00.08 PCB FREE FORM (O) ..... 16 SEP 2025
01 78 23 OPERATION AND MAINTENANCE DATA (O) ..... 16 SEP 2025
01 78 39 PROJECT RECORD DOCUMENTS (O) ..... 16 SEP 2025
01 79 00 DEMONSTRATION AND TRAINING (O) ..... 16 SEP 2025

DIVISION 02 — EXISTING CONDITIONS
02 41 01 DEMOLITION (S) ..... 16 SEP 2025
02 41 16 SELECTIVE STRUCTURE DEMOLITION (S) ..... 16 SEP 2025
02 41 19 SELECTIVE DEMOLITION (A) ..... 16 SEP 2025

DIVISION 03 — CONCRETE
03 05 80 UNDER-SLAB VAPOR BARRIER - RETARDER (S) ..... 16 SEP 2025
03 10 00 CONCRETE FORMING AND ACCESSORIES (S) ..... 16 SEP 2025
03 20 00 CONCRETE REINFORCING (S) ..... 16 SEP 2025
03 30 00 CAST-IN-PLACE CONCRETE (S) ..... 16 SEP 2025
03 54 16 HYDRAULIC CEMENT UNDERLAYMENT (A) ..... 16 SEP 2025

DIVISION 04 — MASONRY
04 20 00 UNIT MASONRY (A) ..... 16 SEP 2025

DIVISION 05 — METALS
05 05 13 SHOP-APPLIED COATINGS FOR METAL (A) ..... 16 SEP 2025
05 12 00 STRUCTURAL STEEL FRAMING (S) ..... 16 SEP 2025
05 21 00 STEEL JOIST FRAMING (S) ..... 16 SEP 2025
05 31 23 STEEL ROOF DECKING (S) ..... 16 SEP 2025
05 40 00 COLD-FORMED METAL FRAMING (S) ..... 16 SEP 2025
05 50 00 METAL FABRICATIONS (A) ..... 16 SEP 2025

DIVISION 06 — WOOD, PLASTICS, AND COMPOSITES
06 10 53 MISCELLANEOUS ROUGH CARPENTRY (A) ..... 16 SEP 2025
06 16 00 SHEATHING (A) ..... 16 SEP 2025
06 20 23 INTERIOR FINISH CARPENTRY (A) ..... 16 SEP 2025
06 41 16 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS (A) ..... 16 SEP 2025

DIVISION 07 — THERMAL AND MOISTURE PROTECTION
07 01 53 ROOF MODIFICATIONS (A) ..... 16 SEP 2025
07 14 00 ELEVATOR PIT WATERPROOFING (A) ..... 16 SEP 2025
07 21 00 THERMAL INSULATION (A) ..... 16 SEP 2025
07 21 29 SPRAY-APPLIED INSULATION (A) ..... 16 SEP 2025
07 26 35 MOISTURE VAPOR EMISSION CONTROL SYSTEM (A) ..... 16 SEP 2025
07 27 26 FLUID-APPLIED MEMBRANE AIR BARRIERS (A) ..... 16 SEP 2025
07 42 13.13 FORMED METAL WALL PANELS (A) ..... 16 SEP 2025
07 42 43 ALUMINUM COMPOSITE PANELS (A) ..... 16 SEP 2025
07 52 16 MODIFIED BITUMINOUS MEMBRANE ROOFING (A) ..... 16 SEP 2025
07 62 00 SHEET METAL FLASHING AND TRIM (A) ..... 16 SEP 2025
07 62 10 FLEXIBLE FLASHING (A) ..... 16 SEP 2025
07 71 00 ROOF SPECIALTIES (A) ..... 16 SEP 2025
07 71 29 MANUFACTURED ROOF EXPANSION JOINTS (A) ..... 16 SEP 2025

07 72 00 ROOF ACCESSORIES (A) ..... 16 SEP 2025
07 84 13 PENETRATION FIRESTOPPING (A) ..... 16 SEP 2025
07 84 46 FIRE-RESISTIVE JOINT SYSTEMS (A) ..... 16 SEP 2025
07 92 00 JOINT SEALANTS (A) ..... 16 SEP 2025
07 95 00 EXPANSION CONTROL (A) ..... 16 SEP 2025

DIVISION 08 — OPENINGS
08 11 13 HOLLOW METAL DOORS AND FRAMES (A) ..... 16 SEP 2025
08 14 16 FLUSH WOOD DOORS (A) ..... 16 SEP 2025
08 31 13 ACCESS DOORS AND FRAMES (A) ..... 16 SEP 2025
08 33 23 OVERHEAD COILING DOORS (A) ..... 16 SEP 2025
08 34 73 SOUND CONTROL DOOR ASSEMBLIES (A) ..... 16 SEP 2025
08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS (A) ..... 16 SEP 2025
08 71 00 DOOR HARDWARE (A) ..... 16 SEP 2025
08 80 00 GLAZING (A) ..... 16 SEP 2025
08 87 00 GLAZING SURFACE FILMS (A) ..... 16 SEP 2025
08 91 19 FIXED LOUVERS (A) ..... 16 SEP 2025

DIVISION 09 — FINISHES
09 22 16 NON-STRUCTURAL METAL FRAMING (A) ..... 16 SEP 2025
09 24 00 CEMENT PLASTERING (A) ..... 16 SEP 2025
09 29 00 GYPSUM BOARD (A) ..... 16 SEP 2025
09 30 00 TILING (A) ..... 16 SEP 2025
09 51 13 ACOUSTICAL PANEL CEILINGS (A) ..... 16 SEP 2025
09 61 16 CONCRETE FLOOR SEALING (A) ..... 16 SEP 2025
09 64 10 WOOD STAGE FLOORING (A) ..... 16 SEP 2025
09 65 13 RESILIENT BASE AND ACCESSORIES (A) ..... 16 SEP 2025
09 65 19 RESILIENT TILE FLOORING (A) ..... 16 SEP 2025
09 68 13 CARPET TILE (A) ..... 16 SEP 2025
09 81 16 ACOUSTICAL BLANKET INSULATION (A) ..... 16 SEP 2025
09 84 33 SOUND ABSORBING WALL UNITS (A) ..... 16 SEP 2025
09 84 36 SOUND-ABSORBING CEILING UNITS (A) ..... 16 SEP 2025
09 91 00 PAINTING (A) ..... 16 SEP 2025

DIVISION 10 — SPECIALTIES
10 11 00 VISUAL DISPLAY UNIT (A) ..... 16 SEP 2025
10 14 00 SIGNAGE (A) ..... 16 SEP 2025
10 22 38 OPERABLE PANEL PARTITIONS (A) ..... 16 SEP 2025
10 26 00 WALL AND DOOR PROTECTION (A) ..... 16 SEP 2025
10 44 13 FIRE PROTECTION CABINETS (A) ..... 16 SEP 2025
10 44 16 FIRE EXTINGUISHERS (A) ..... 16 SEP 2025
10 73 23 CANOPIES AND TRELLISES (A) ..... 16 SEP 2025

DIVISION 11 — EQUIPMENT
11 61 33 THEATRICAL RIGGING SYSTEMS (TR) ..... 16 SEP 2025
11 61 43 STAGE DRAPERIES (TR) ..... 16 SEP 2025
11 61 62 THEATRICAL LIGHTING SYSTEMS (TR) ..... 16 SEP 2025

DIVISION 12 — FURNISHINGS
12 21 13 HORIZONTAL LOUVER BLINDS (A) ..... 16 SEP 2025
12 24 13 ROLLER WINDOW SHADES (A) ..... 16 SEP 2025
12 36 23.13 PLASTIC-LAMINATE-CLAD COUNTERTOPS (A) ..... 16 SEP 2025
12 36 62 SOLID SURFACING MATERIAL (A) ..... 16 SEP 2025

DIVISION 13 — SPECIAL CONSTRUCTION
NOT USED

DIVISION 14 — CONVEYING EQUIPMENT
14 24 00 HYDRAULIC ELEVATORS (A) ..... 16 SEP 2025
14 27 00 ELEVATOR RENOVATION (A) ..... 16 SEP 2025
14 42 00 WHEELCHAIR LIFTS (A) ..... 16 SEP 2025

DIVISION 20 — FACILITY SERVICES GENERAL REQUIREMENTS
NOT USED

DIVISION 21 — FIRE SUPPRESSION

21 01 00	FIRE PROTECTION GENERAL REQUIREMENTS (MEP)	16 SEP 2025
21 05 00	COMMON WORK RESULTS FOR FIRE SUPPRESSION (MEP)	16 SEP 2025
21 13 00	FIRE-SUPPRESSION SPRINKLER SYSTEMS (MEP)	16 SEP 2025

DIVISION 22 — PLUMBING

22 01 00	PLUMBING GENERAL REQUIREMENTS (MEP)	16 SEP 2025
22 01 20	PLUMBING SHOP DRAWINGS AND SUBMITTALS (MEP)	16 SEP 2025
22 01 50	PLUMBING AND PIPING MATERIALS AND METHODS (MEP)	16 SEP 2025
22 05 29	HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT (MEP)	16 SEP 2025
22 05 53	IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT (MEP)	16 SEP 2025
22 07 19	PLUMBING PIPING INSULATION (MEP)	16 SEP 2025
22 10 05	PLUMBING PIPING (MEP)	16 SEP 2025
22 10 06	PLUMBING PIPING SPECIALTIES (MEP)	16 SEP 2025
22 40 00	PLUMBING FIXTURES (MEP)	16 SEP 2025

DIVISION 23 — HEATING VENTILATING AND AIR CONDITIONING

23 01 00	MECHANICAL GENERAL REQUIREMENTS (MEP)	16 SEP 2025
23 01 20	MECHANICAL SHOP DRAWINGS AND SUBMITTALS (MEP)	16 SEP 2025
23 01 30.51	HVAC AIR-DISTRIBUTION SYSTEM CLEANING (MEP)	16 SEP 2025
23 01 50	MECHANICAL MATERIALS AND METHODS (MEP)	16 SEP 2025
23 05 13	COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT (MEP)	16 SEP 2025
23 05 29	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT (MEP)	16 SEP 2025
23 05 53	IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT (MEP)	16 SEP 2025
23 05 93	TESTING, ADJUSTING, AND BALANCING FOR HVAC (MEP)	16 SEP 2025
23 07 13	DUCT INSULATION (MEP)	16 SEP 2025
23 07 19	HVAC PIPING INSULATION (MEP)	16 SEP 2025
23 09 34	VARIABLE-FREQUENCY MOTOR CONTROLLERS FOR HVAC (MEP)	16 SEP 2025
23 21 13	HYDRONIC PIPING (MEP)	16 SEP 2025
23 21 23	HYDRONIC PUMPS (MEP)	16 SEP 2025
23 25 00	HVAC WATER TREATMENT (MEP)	16 SEP 2025
23 31 00	HVAC DUCTS AND CASINGS (MEP)	16 SEP 2025
23 33 00	AIR DUCT ACCESSORIES (MEP)	16 SEP 2025
23 34 23	HVAC POWER VENTILATORS (MEP)	16 SEP 2025
23 36 00	AIR TERMINAL UNITS (MEP)	16 SEP 2025
23 64 16	CENTRIFUGAL WATER CHILLERS (MEP)	16 SEP 2025
23 64 23	SCROLL WATER CHILLERS (MEP)	16 SEP 2025
23 73 13	MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS (MEP)	16 SEP 2025

DIVISION 25 — INTEGRATED AUTOMATION

NOT USED

DIVISION 26 — ELECTRICAL

26 01 00	ELECTRICAL GENERAL REQUIREMENTS (MEP)	16 SEP 2025
26 01 20	ELECTRICAL SHOP DRAWINGS AND SUBMITTALS (MEP)	16 SEP 2025
26 05 19	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (MEP)	16 SEP 2025
26 05 26	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS (MEP)	16 SEP 2025
26 05 29	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS (MEP)	16 SEP 2025
26 05 33.13	CONDUIT FOR ELECTRICAL SYSTEMS (MEP)	16 SEP 2025
26 05 33.16	BOXES FOR ELECTRICAL SYSTEMS (MEP)	16 SEP 2025
26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS (MEP)	16 SEP 2025
26 05 73	POWER SYSTEM STUDIES (MEP)	16 SEP 2025
26 08 00	COMMISSIONING OF ELECTRICAL (MEP)	16 SEP 2025
26 09 43	LIGHTING CONTROL SYSTEM (MEP)	16 SEP 2025
26 22 00	LOW-VOLTAGE TRANSFORMERS (MEP)	16 SEP 2025
26 24 13	SWITCHBOARDS (MEP)	16 SEP 2025
26 24 16	PANELBOARDS (MEP)	16 SEP 2025
26 27 26	WIRING DEVICES (MEP)	16 SEP 2025
26 28 13	FUSES (MEP)	16 SEP 2025
26 28 16.13	ENCLOSED CIRCUIT BREAKERS (MEP)	16 SEP 2025
26 28 16.16	ENCLOSED SWITCHES (MEP)	16 SEP 2025
26 29 13	ENCLOSED CONTROLLERS (MEP)	16 SEP 2025

26 43 13 SURGE PROTECTIVE DEVICES (MEP) ..... 16 SEP 2025
26 51 00 INTERIOR LIGHTING (MEP) ..... 16 SEP 2025
26 56 00 EXTERIOR LIGHTING (MEP) ..... 16 SEP 2025

DIVISION 27 — COMMUNICATIONS
27 00 10 GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEM (T) ..... 16 SEP 2025
27 05 33 PATHWAYS FOR COMMUNICATION SYSTEMS (T) ..... 16 SEP 2025
27 10 00 STRUCTURED CABLING SYSTEM (T) ..... 16 SEP 2025
27 41 16 INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT (TR) ..... 16 SEP 2025
27 51 00 PUBLIC ADDRESS AND CLOCK SYSTEM (T) ..... 16 SEP 2025

DIVISION 28 — ELECTRONIC SAFETY AND SECURITY
28 00 00 COMMON ELECTRONIC SAFETY AND SECURITY REQUIREMENTS (MEP) ..... 16 SEP 2025
28 05 03 ELECTRONIC SAFETY AND SECURITY SHOP DRAWINGS AND SUBMITTALS (MEP) ..... 16 SEP 2025
28 05 10 SCOPE OF THE ELECTRONIC SAFETY AND SECURITY WORK (MEP) ..... 16 SEP 2025
28 05 37 EMERGENCY RESPONDER RADIO ANTENNA SYSTEM (MEP) ..... 16 SEP 2025
28 13 00 ACCESS CONTROL SYSTEM (T) ..... 16 SEP 2025
28 16 00 INTRUSION DETECTION SYSTEM (T) ..... 16 SEP 2025
28 23 00 VIDEO SURVEILLANCE SYSTEM (T) ..... 16 SEP 2025
28 46 00 FIRE DETECTION AND ALARM (MEP) ..... 16 SEP 2025

DIVISION 31 — EARTHWORK
31 00 00 EARTHWORK UNDER BUILDING PAD (S) ..... 16 SEP 2025
31 22 13 SITE GRADING (C) ..... 16 SEP 2025
31 23 33 TRENCHING AND BACKFILL (C) ..... 16 SEP 2025
31 32 13.19 LIME STABILIZATION (C) ..... 16 SEP 2025
31 32 13.26 LIME FLY ASH OR FLY ASH (C) ..... 16 SEP 2025
31 41 33 TRENCH SAFETY (C) ..... 16 SEP 2025
31 63 29 DRILLED CONCRETE PIERS AND SHAFTS (S) ..... 16 SEP 2025

DIVISION 32 — EXTERIOR IMPROVEMENTS
32 13 13 CONCRETE SITE PAVING (C) ..... 16 SEP 2025
32 17 23.13 PAINTED PAVEMENT MARKINGS (C) ..... 16 SEP 2025
32 31 13 CHAIN LINK FENCES AND GATES (A) ..... 16 SEP 2025
32 92 00 TURF AND GRASSES (C) ..... 16 SEP 2025

DIVISION 33 — UTILITIES
33 10 00 WATER DISTRIBUTION (C) ..... 16 SEP 2025
33 30 00 SANITARY SEWER (C) ..... 16 SEP 2025
33 40 00 STORM DRAINAGE (C) ..... 16 SEP 2025

DIVISION 34 — TRANSPORTATION
NOT USED

DIVISION 35 — WATERWAY AND MARINE
NOT USED

DIVISION 40 — PROCESS INTEGRATION
NOT USED

DIVISION 41 — MATERIAL PROCESSING AND HANDLING EQUIPMENT
NOT USED

DIVISION 42 — PROCESS HEATING, COOLING, AND DRYING EQUIPMENT
NOT USED

DIVISION 43 — PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE EQUIPMENT
NOT USED

DIVISION 44 — POLLUTION AND WASTE CONTROL EQUIPMENT
NOT USED

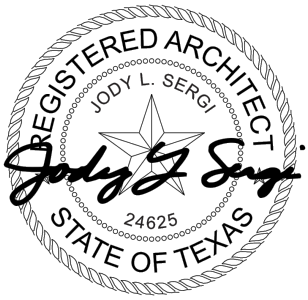
DIVISION 45 — INDUSTRY-SPECIFIC MANUFACTURING EQUIPMENT
NOT USED

DIVISION 46 — WATER AND WASTEWATER EQUIPMENT
NOT USED

DIVISION 48 — ELECTRICAL POWER GENERATION
NOT USED

DOCUMENT 00 01 07.1 - ARCHITECT SEAL PAGE

All sections identified on the Table of Contents with a suffix of (A) have been furnished by the Architect for this Project:



16 SEPTEMBER 2025

DOCUMENT 00 01 07.2 – CIVIL SEAL PAGE

All sections identified on the Table of Contents with a suffix of (C) have been furnished by **AURIC ENGINEERS** (Civil Engineer) for this Project:



CIVIL SEAL

9/16/2025
Texas Engineering Firm No. 20740

DOCUMENT 00 01 07.4 – STRUCTURAL SEAL PAGE

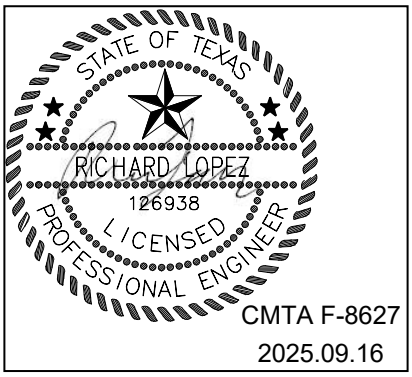
All sections identified on the Table of Contents with a suffix of (S) have been furnished by **DALLY + ASSOCIATES** (Structural Engineer) for this Project:



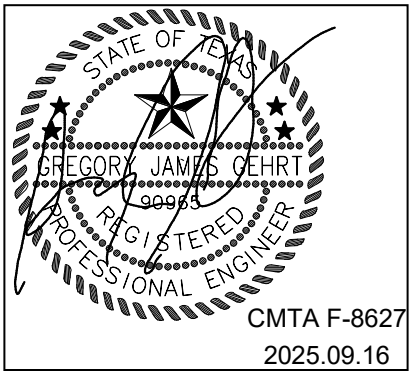
STRUCTURAL SEAL

DOCUMENT 00 01 07.5 - MEP SEAL PAGE

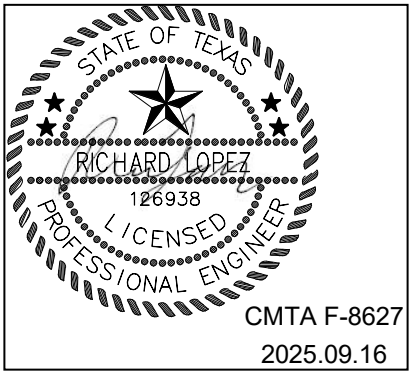
All sections identified on the Table of Contents with a suffix of (MEP) have been furnished by **CMTA** (Mechanical, Electrical or Plumbing Engineer) for this Project:



MECHANICAL SEAL



ELECTRICAL SEAL



PLUMBING SEAL

DOCUMENT 00 01 07.7 – TECHNOLOGY SEAL PAGE

All sections identified on the Table of Contents with a suffix of (T) have been furnished by **COMBS GROUP** (Data, Security) for this Project:



TECHNOLOGY SEAL

Docusign Envelope ID: 24EE9E74-578C-4225-B74D-407014D20C44

INSPIRE • EQUIP • IMAGINE

Fort Bend Independent School District

Competitive Sealed Proposal For

BP030 Willowridge HS Renovations
CSP 26-006AL

Package "A" Base Bid and all documents except Alternates & SBE documents.
DUE NO LATER THAN 2:00 P.M. Central Time (CT) October 30, 2025

Package "B" Alternates and Package "C" SBE
Due NO LATER THAN
3:00 P.M. (CT) October 30, 2025

Bids will be opened and read aloud at 3:00 PM. Package "A" is still due at 2:00 PM (CT) and will be held by the district until the public opening at "3:00 PM (CT)".
LATE PROPOSALS WILL NOT BE ACCEPTED

SUBMIT PROPOSAL PACKET THROUGH:

FBISD Bid Portal: https://fortbendisd.bonfirehub.com/portal/

Signed by: Nancy Lane F77F1A85ABE744F... 9/17/2025

Signed by: Brenda Garcia F7F6BD96D7C742E... 9/17/2025

Signed by: Ryan J. Kiefer F973D1CC91A41D... 9/17/2025

Signed by: DF25ADA7E416421... 9/17/2025

Docusign Envelope ID: 24EE9E74-578C-4225-B74D-407014D20C44

BP030 – Willowridge HS Renovations
CSP 26-006AL

BACKGROUND:

Fort Bend ISD (FBISD) is a K-12 public school district in Fort Bend County serving a student enrollment of over 75,000. The district currently consists of 80 campuses and multiple administrative sites. The intention of this Competitive Sealed Proposal (CSP) is to solicit proposals for the interior renovations and new addition at Willowridge High School (BP030). The estimated construction cost of work for this project is **Fifteen Million Dollars. ($15,000,000).**

PRE-PROPOSAL CONFERENCE:

A pre-proposal conference is scheduled for **Thursday, October 9, 2025,** at **2:00 p.m.** via Microsoft Teams. (**Click this link to join the meeting): Join the meeting now.** Attendance is highly recommended in order to have an understanding of the requirements of this CSP. For this pre-proposal meeting, persons with disabilities requiring special accommodations should contact Antoinette Lewis,Buyer at Antoinette.Lewis1@fortbendisd.com at least two (2) days before the conference. Any questions/clarifications that result from the visit should be submitted through the **Opportunity Q&A section in Bonfire.**

WALK SCHEDULE:

A pre-proposal walk is scheduled for **October 10, 2025, at 2:00 p.m. (CST)** at:

Willowridge High School
Address: 16301 Chimney Rock Road, Houston, TX 77053

Attendance is highly recommended in order to have an understanding of existing site conditions and the project's scope of work.

SPECIAL NOTE:

Please be reminded that all Fort Bend ISD campuses and departments are tobacco, drug, and weapon-free facilities. Contractors are responsible for the conduct of their employees and adherence to Fort Bend ISD building policies.

QUESTIONS AND ANSWERS:

Any questions or needed clarifications shall be submitted through the Opportunity Q&A section in Bonfire before the deadline for questions due date and time; **Monday, October 20, 2025, 10:00 a.m. (CST).** Questions received by the deadline and corresponding answers will be included in an Addendum and posted in FBISD e-bidding portal Bonfire.

Docusign Envelope ID: 24EE9E74-578C-4225-B74D-407014D20C44

All Fort Bend ISD procurement solicitations and addendums can be accessed on Bonfire at https://fortbendisd.bonfirehub.com PLEASE **NOTE THAT IT IS THE RESPONSIBILITY OF THE PROPOSERS TO CHECK FOR ANY ADDENDUMS ON THE BONFIRE ELECTRONIC BIDDING SYSTEM PRIOR TO SUBMITTING A PROPOSAL.**

GENERAL TERMS, CONDITIONS, AND REQUIREMENTS FOR SOLICITATIONS:

This solicitation shall be governed by the documents incorporated herein as well as the Fort Bend ISD General Provisions for Purchasing Solicitations are incorporated herein. A copy may be obtained at http://www.fortbendisd.com/docs/purchasing/general-provisions-for-purchasing-solicitations-and-contracts.pdf or by contacting the Fort Bend ISD Buyer listed on the coversheet.

Copy of the Construction contract, the A101 and A 201, are incorporated herein.
Texas Education Code 44.031(a)(5); Texas Government Code Chapter 2269
Purchasing and Acquisition, FBISD Policy CH (Legal)
Purchasing and Acquisition, FBISD Policy CH (Local)
Facilities and Construction, FBISD Policy CV (Legal)
Facilities and Construction, FBISD Policy CV (Local)

Proposers are required to respond to all requests identified in this CSP and indicate their acceptance or objection to the terms of the CSP, the General Provisions, and the terms of the Agreement for Construction Services. Any exceptions to the terms and conditions in the CSP, the General Provisions, or the Agreement for Construction Services must be clearly indicated in the Proposer's submitted proposal. Each Proposer, by submitting its proposal, represents that the Proposer has read, understands, and agrees with the CSP, the General Provisions, and the Agreement for Construction Services, excluding any exception specifically made by Proposer in its proposal

Scope of Work

FBISD is seeking a contractor to provide upgrades to interior renovations to the existing Willowridge High School and a new addition of a 10,500 square foot, single-story structure.

Contractor Experience and References

Contractor must provide customer references letter in order to receive points in the evaluation criteria section. Contractor must provide proof of pertinent experience (previous educational experience) along with documentation of successfully completed projects within the last 3 to 5 years for K-12 interior renovations with a minimum construction cost of $10,000,000.

For information and questions regarding this CSP process, please contact:

Senior Buyer: Antoinette Lewis
Email: Antoinette.lewis1@fortbendisd.com

Docusign Envelope ID: 24EE9E74-578C-4225-B74D-407014D20C44

EVALUATION CRITERIA:

Proposals shall be evaluated using the evaluation criteria listed below, and the scope of work will be awarded by Project. Based on scope of work, FBISD reserves the right to award the Project to the top ranked contractor in the manner that provides the best value to the district based on price and other evaluation criteria.

	Evaluation Criteria (Government Code 2269)	Point System
1	**The price; Section 2269.055.a (1)** Total Proposed Pricing - Provides thoroughly developed, competitive pricing using the tables in Pricing Delivery information section of the CSP	40 points
2	**Offeror's experience and reputation; Section 2269.055.a (2)** Provides evidence of your experience in planning, staging and delivery of recent projects of similar scope and scale (14 pts)	19 points
	Past experience with FBISD and other school districts Provides a summary of nature of work, on time delivery and quality of work contracted with FBISD and/or other school districts and FBISD's assessment of the presented summary. (5 pts)	
3	**Quality of the offeror's goods or services; Section 2269.055.a (3)** Contractor's products should be new and be of the highest quality with an option to substitute for a company branded item of equivalent quality. (14pts)	21 points
	Quality of contractor's response in the proposal Effectively responds and processes all request for information and documentation included in this CSP (2pts)	
	Project Plan and schedule (5pts)	
4	**Utilization of historically underutilized businesses; Section 2269.055.a (4)**	N/A
5	**Offeror's safety record; Section 2269.055.a (5)** Provides a summary of Experience Modification Rate (EMR) for the last three years, as well as a summary of your company's safety policies and procedures	5 points
6	**Offeror's proposed personnel; Section 2269.055.a (6)** Proposed Personnel, personnel directly assigned to work on this project	5 points
7	**Offeror's financial capability appropriate to the size and scope of the project; Section 2269.055.a (7)** Provide proof of Insurance, financial stability and Letter of Surety from Bonding Company	5 points
8	**SBE Commitment; CV (Local) 2017.04**	5 points
	TOTAL	100

Docusign Envelope ID: 24EE9E74-578C-4225-B74D-407014D20C44

TIME TABLE:

FBISD anticipates following the time table listed below for this proposal: **The time table is only an estimate and actual dates may vary.**

Item	Activity	Date
1.	Job starts to advertise (1st run)	9/28/2025
2.	Job advertises (2nd run)	10/5/2025
3.	Pre-Proposal Conference 2:00 p.m. (CST)	10/9/2025
4.	Final Questions Due 10:00 a.m. (CST)	10/20/2025
5a.	Proposal Package "A" Due **2:00 PM (CST)** Base Bid and all documents, except Alternates and SBE documents. Click or tap here to enter text.	10/30/2025
5b.	Proposal Package "B" Due **3:00 PM (CST) Alternates only**	10/30/2025
5c.	Proposal Package "C" Due **3:00 PM (CST) SBE documents only**	10/30/2025
6.	Presentation to Board of Trustees for contract award (Tentative, subject to change)	01/2026
7.	Tabulations and awards posted to https://fortbendisd.bonfirehub.com/portal/?tab=pastOpportunities	01/2026
8.	Substantial Completion of the Work	02/2028

SUBMISSION DEADLINE:

Fort Bend ISD will accept proposals submitted electronically through Bonfire e-bidding portal until ***Thursday, October 30, 2025, at 2:00 pm (CST).*** https://fortbendisd.bonfirehub.com.

Proposals must be uploaded and finalized prior to the closing date and time. Proposals received after the opening will not be accepted. Public bid opening will be conducted via Teams on ***Thursday, October 30, 2025, at 3:00 pm (CST).*** **(Click this link to join the meeting): Join the meeting now.**

It is recommended that once you have completed your final submission and received a notice status of "Submission Complete" from Bonfire, you access your account again and review the documents to verify that the correct content has been provided.

Once the close date has passed, you will be unable to submit an opportunity or make changes to anyof the submitted documents. **HARD-COPY PAPER FAXED OR E-MAILED SUBMISSIONS WILL NOT BE ACCEPTED.** Only responses properly submitted to FBISD Bonfire Purchasing Portal will be considered.

Docusign Envelope ID: 24EE9E74-578C-4225-B74D-407014D20C44

Prevailing Wage Rate
Determination Information

The following information is from Chapter 2258 Texas Government Code:

Sec. 2258.021. Right to be Paid Prevailing Wage Rates.

(a) A worker employed on a public work by or on behalf of the state or a political subdivision of the state shall be paid:
    (1) not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the work is performed; and
    (2) not less than the general prevailing rate of per diem wages for legal holiday and overtime work.
(b) Subsection (a) does not apply to maintenance work.
(c) A worker is employed on a public work for the purposes of this section if the worker is employed by a contractor or subcontractor in the execution of a contract for the public work with the state, a political subdivision of the state, or any officer or public body of the state or a political subdivision of the state.

Sec. 2258.023. Prevailing Wage Rates to be paid by Contractor and Subcontractor; Penalty.

(a) The contractor who is awarded a contract by a public body or a subcontractor of the contractor shall pay not less than the rates determined under Section 2258.022 to a worker employed by it in the execution of the contract.
(b) A contractor or subcontractor who violates this section shall pay to the state or a political subdivision of the state on whose behalf the contract is made, $60 for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rates stipulated in the contract. A public body awarding a contract shall specify this penalty in the contract.
(c) A contractor or subcontractor does not violate this section if a public body awarding a contract does not determine the prevailing wage rates and specify the rates in the contract as provided by Section 2258.022.
(d) The public body shall use any money collected under this section to offset the costs incurred in the administration of this chapter.
(e) A municipality is entitled to collect a penalty under this section only if the municipality has a population of more than 10,000.

Sec. 2258.051. Duty of Public Body to Hear Complaints and Withhold Payment.

A public body awarding a contract, and an agent or officer of the public body, shall:

(1) take cognizance of complaints of all violations of this chapter committed in the execution of the contract; and
(2) withhold money forfeited or required to be withheld under this chapter from the payments to the contractor under the contract, except that the public body may not withhold money from other than the final payment without a determination by the public body that there is good cause to believe that the contractor has violated this chapter.

Docusign Envelope ID: 24EE9E74-578C-4225-B74D-407014D20C44

Prevailing Wage Rates – School Construction Trades

June 1, 2022

Texas Gulf Coast Area

CLASSIFICATION	2022 HOURLY RATE
ASBESTOS WORKER	$21.13
BRICKLAYER; MASON	$25.32
CARPENTER; CASEWORKER	$23.38
CARPET LAYER; FLOOR INSTALLER	$25.12
CONCRETE FINISHER	$23.40
DATA COMM/TELE COMM	$23.50
DRYWALL INSTALLER; CEILING INSTALLER	$26.65
ELECTRICIAN	$25.93
ELEVATOR MECHANIC	$28.80
FIREPROOFING INSTALLER	$22.25
GLAZIER	$22.30
HEAVY EQUIPMENT OPERATOR	$22.40
INSULATOR	$20.50
IRONWORKER	$25.50
LABORER, HELPER	$16.71
LATHERER; PLASTERER	$23.25
LIGHT EQUIPMENT OPERATOR	$20.50
METAL BUILDING ASSEMBLER	$21.10
MILLWRIGHT	$33.63
PAINTER; WALL COVERING INSTALLER	$19.60
PIPEFITTER	$26.97
PLUMBER	$26.71
ROOFER	$20.50
SHEET METAL WORKER	$19.90
SPRINKLER FITTER	$26.13
STEEL ERECTOR	$23.25
TERRAZZO WORKER	$23.50
TILE SETTER	$19.58
WATERPROOFER; CAULKER	$19.88

This document was developed by PBK Architects, Inc., in strict accordance with Chapter 2258 of the Texas Government Code.

Docusign Envelope ID: 24EE9E74-578C-4225-B74D-407014D20C44

Prevailing Wage Rates
Worker Classification Definition Sheet

CLASSIFICATION	DEFINITION
ASBESTOS WORKER	Worker who removes and disposes of asbestos materials.
BRICKLAYER; MASON	Craftsman who works with masonry products, stone, brick, block, or any material substituting those materials and accessories.
CARPENTER; CASEWORKER	Worker who build wood structures or structures of any material which has replaces wood. Includes rough and finish carpentry, hardware and trim.
CARPET LAYER; FLOOR INSTALLER	Worker who installs carpets and/or floor coverings, vinyl tile.
CONCRETE FINISHER	Worker who floats, trowels, and finishes concrete.
DATA COMM/TELE COMM	Worker who installs data/telephone and television cable and associate equipment and accessories.
DRYWALL; CEILING INSTALLER	Worker who installs metal framed walls and ceiling, drywall coverings, ceiling grids, and ceilings.
ELECTRICIAN	Skilled craftsman who installs or repairs electrical wiring and devices. Includes fire alarm systems and HVAC electrical controls.
ELEVATOR MECHANIC	Craftsman skilled in the installation and maintenance of elevators.
FIREPROOFING INSTALLER	Worker who sprays or applies fire proofing materials.
GLAZIER	Worker who installs glass, glazing, and glass framing.
HEAVY EQUIPMENT OPERATOR	Includes but not limited to: all CAT tractors, all derrick-powered, all power operated cranes, back-hoes, back-fillers, power operated shovels, winch trucks, and all trenching machines.
INSULATOR	Worker who applies, sprays, or installs insulation.
IRONWORKER	Skilled craftsman who erects structural steel framing and installs structural concrete Rebar
LABORER, HELPER	Worker qualified for only unskilled or semi-skilled work. Lifting, carrying materials or tools, hauling, digging, clean up.
LATHERER; PLASTERER	Worker who installs metal framing and lath. Worker who applies plaster to lathing and installs associated accessories.
LIGHT EQUIPMENT OPERATOR	Includes but not limited to, air compressors, truck crane drivers, flex planes, building elevators, form graders, concrete mixers less than 14cf), conveyers.
METAL BUILDING ASSEMBLER	Worker who assembles pre-made metal buildings.
MILLWRIGHT	Mechanic specializing in the installation of heavy machinery, conveyance, wrenches, dock levelers, hydraulic lifts, and align pumps.
PAINTER; WALL COVERING INSTALLER	Worker who prepares wall surfaces and applies paint and/or coverings, tape, and bedding.
PIPEFITTER	Trained worker who installs piping systems, chilled water piping and hot water (boiler) piping, pneumatic tubing controls, chillers, boilers, and associated mechanical equipment.
PLUMBER	Skilled craftsman who installs domestic hot and cold-water piping, waste piping, storm system piping, water closets, sinks, urinals, and related work.
ROOFER	Worker who installs roofing materials, Bitumen (asphalt and coal tar) felts, flashings, all types of roofing membranes, and associated products.
SHEET METAL WORKER	Worker who installs sheet metal products, Roof metal, flashings and curbs, ductwork, mechanical equipment, and associated metals.
SPRINKLER FITTER	Worker who installs fire sprinklers systems and fire protectant equipment.
STEEL ERECTOR	Worker who erects and dismantles structural steel frames of buildings and other structures.
TERRAZZO WORKER	Craftsman who places and finishes Terrazzo.

Docusign Envelope ID: 24EE9E74-578C-4225-B74D-407014D20C44

TILE SETTER	Worker who prepares wall and/or floor surfaces and applies ceramic tiles to these surfaces.
WATERPROOFER; CAULKER	Worker who applies water proofing material to buildings. Products include sealant, caulk, sheet membranes, and liquid membranes, sprayed, rolled or brushed.

INSTRUCTIONS TO BIDDERS

TABLE OF CONTENTS

TABLE OF CONTENTS

INSTRUCTION TO BIDDERS .....

BIDDERS COMMUNICATION..... 0

GENERAL INFORMATION..... 1.0

PREBID 2.0

PROPOSAL SUBMISSION..... 3.0

INTERPRETATION OF COMPETITIVE SEALED PROPOSAL DOCUMENTS 4.0

SUBSTITUTIONS OF MATERIALS AND EQUIPMENT 5.0

BID BOND/BID GUARANTEE 6.0

PERFORMANCE BOND AND PAYMENT BOND 7.0

INSURANCE..... 8.0

EVALUATION CRITERIA AND RELATIVE WEIGHTS..... 9.0

SUBMISSION OF POST COMPETITIVE SEALED COMPETITIVE INFORMATION 10.0

NOTICE TO PROCEED 11.0

COMPLETION TIME 12.0

RETAINAGE 13.0

ASBESTOS, LEAD AND PCBS CONTAINING MATERIALS 14.0

AVAILABILITY OF MATERIALS AND SYSTEMS 15.0

USE OF ASBESTOS FREE MATERIALS, PRODUCTS AND SYSTEMS..... 16.0

Instructions to Bidders:

Bidders Communication

Please remember that during the selection process, we desire to avoid even the perception of preferential treatment.

Therefore:

- **Other than the designated contact person listed in this CSP: All Communication regarding this CSP with district employees, staff, consultants (Architects/Engineers), or Board members is strictly forbidden and may result in disqualification.**
- **All requests for clarification must be provided in writing to the designated person.**
- **The answer to the request for clarification and all other communication, clarification, or questions regarding this CSP will be issued in writing by addenda to all participants.**

The district electronic bidding portal https://fortbendisd.bonfirehub.com/portal/ is the source for all CSP documents and direction; Addenda, Proposal packet, Drawings and specifications.

- **VERY IMPORTANT**
  - **Communication regarding this CSP with district employees, staff, consultants (Architects/Engineers), or Board members is strictly forbidden and may result in disqualification. (Other than the designated contact person listed in this CSP.)**

CSP Process for Successful Bidders

1.0 GENERAL INFORMATION

1.1 The Proposer will furnish and pay for a bid bond in the form of a bid bond, postal money order, certified check or cashier's check in the amount of five percent (5%) of the total greatest amount, bid including any applicable alternates, in accordance with Section 6.0.

1.2 If awarded, the Bidder shall furnish and pay for a Performance Bond and a Payment Bond each in the full contract amount in accordance with Section 7.0. Include this cost in your bid.

1.3 Bidder shall carry and keep in full force for the duration of the Project, insurance coverage for builder's risk, workmen's compensation, comprehensive general liability, and automobile liability as required by the General Provisions and/or Supplementary General Conditions of the Specifications, as outlined in Section 8.0.

1.4 The Bidder will assign a competent full-time superintendent, to the project, and that superintendent shall be maintained on the project for the duration of the project, subject only to his continuous employment.

1.5 During this process all communication regarding this CSP with district employees, staff, consultants (Architects/Engineers), or Board members is strictly forbidden and may result in disqualification. (Other than the designated contact person listed in this CSP)

1.6 In accordance with Texas Government Code Section 2269, The Board of Trustees, as appropriate, has delegated its authority under this subchapter regarding an action authorized or required by this subchapter to be taken by a school district to the Ft Bend ISD Superintendent. In procuring the construction services, the Board of Trustees has delegated the ranking, selection, or evaluation of bids.

1.7 In determining the award of contract and in accordance with Texas Government Code Section 2269, the district may consider: the price, the offeror's experience and reputation, the quality of the offeror's goods or services, the impact on the ability of the governmental entity to comply with rules relating to historically underutilized businesses, the offeror's safety record, the offeror's proposed personnel, whether the offeror's financial capability is appropriate to the size and scope of the project; and any other relevant factor specifically listed in the request for bids, proposals, or qualifications.

1.8 Evaluation of the proposed substitutes/deviations does not constitute Owner's acceptance of the substitutes/deviations but can be considered during negotiations.

1.9 In accordance with Texas Government Code Section 2269, The district shall select the offeror that submits the proposal that offers the best value for the governmental entity based on:

- the selection criteria in the request for proposal and the weighted value for those criteria in the request for proposal; and
- its ranking evaluation.

1.10 In accordance with Texas Government Code Section 2269 the Board of Trustees has determined the method that provided the best value for the district is the Competitive Sealed Proposal method.

1.11 In accordance with Texas Government Code Section 2269 the district shall publish in the request for proposals or qualifications the criteria that will be used to evaluate the offerors, and the applicable weighted value for each criterion.

1.12 In accordance with Texas Government Code Section 2269 the district shall document the basis of its selection and shall make the evaluations public not later than the seventh day after the date the contract is awarded.

1.13 In accordance with Texas Government Code Section 2269, the district will receive, publicly open, and read aloud the names of the offerors and their bids.

1.14 In accordance with Texas Government Code Section 2269, the district will evaluate and rank each proposal submitted no later than 45 days after the opening.

1.15 In accordance with Texas Government Code Section 2269, The district shall first attempt to negotiate a contract with the selected offeror. The district and its architect or engineer may discuss with the selected offeror options for a scope or time modification and any price change associated with the modification. If the district is unable to negotiate a satisfactory contract with the selected offeror, the district shall, formally and in writing, end negotiations with that offeror and proceed to the next offeror in the order of the selection ranking until a contract is reached or all proposals are rejected.

2.0 COMPETITIVE SEALED BID DOCUMENTS PRE-BID

2.1 A Pre-proposal conference will be held as required. Representatives of the Owner, and design team will be present at this meeting. All Bidders are encouraged to attend.

3.0 COMPETITIVE SEALED PROPOSAL PACKET

3.1 Bids will be received only on the Owner's "Bid Form" for the work as indicated by the proposal documents, filled in, and submitted in Bonfire as listed below. Bids will be received at no other place.

3.2 Bonfire Submittal Organization

SUBMIT PROPOSAL PACKET THROUGH:
https://fortbendisd.bonfirehub.com/portal/

Submission Package "A"	
CSP Cover Page Addenda Acknowledgment Section Bid Bond Base Bid Form	**DUE on Bid Day at 2:00 PM**
All required Forms	**DUE on Bid Day at 2:00 PM**
Financial Section	**DUE on Bid Day at 2:00 PM**
Safety Manual	**DUE on Bid Day at 2:00 PM**
Submission Package "B"	**Submit Through Bonfire E-Bidding Portal Package "B" DUE same day at 3:00PM**
Alternate Pricing	
Submission Package "C"	
SBEP commitment Submission	**Submit Through Bonfire E-Bidding Portal Package "C" DUE same day at 3:00PM**

4.0 INTERPRETATION OF COMPETITIVE SEALED PROPOSAL DOCUMENTS

4.1 Bidders and sub-Bidders requiring "CSP" clarification or interpretation of the CSP documents shall make the request in written form, by email to FBISD buyer listed in the CSP documents.

4.2 Any interpretation, correction or change of the CSP documents will be made by Addendum and posted to our website. Interpretations, corrections or changes of the CSP documents made in any other manner will not be binding.

5.0 SUBSTITUTIONS OF MATERIALS AND EQUIPMENT

5.1 Substitutions of Goods. The materials, products and equipment described in the CSP documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. The materials and equipment named in, and the procedures covered by these specifications have been selected as a standard because of quality, particular suitability or record of satisfactory performance. It is not intended to preclude the use of equal or better See (Part V, Section 3.9 of General Provisions)

5.2 If the Owner/Engineer approves any proposed substitution prior to receipt of bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

5.3 No deviations are allowed in the base bid or base bid adjustment. Any deviation from the Base Bid shall be submitted as Alternate No. 2 on the Deviations Form.

5.4 Evaluation of the proposed substitutes/deviations does not constitute Owner's acceptance of the substitutes/deviations but can be considered during negotiations.

5.5 Price scores will be based on the base bid plus/minus the base bid adjustment which must be in adherence to all plans and specifications published.

6.0 BID BOND/BID GUARANTEE

6.1 Bid bonds are required for bids in excess of $25,000. A Bid bond will be submitted in the form of a Bid bond, postal money order, certified check or cashier's check in an amount not less than **five percent (5%) of the total greatest amount bid, including any applicable alternates,** payable without recourse to Fort Bend Independent School District. Failure to furnish a bid guarantee in the proper form and amount by the time set for opening may be cause for rejection of the bid. If the successful Bidder, upon acceptance of his bid by the District within the period specified therein for acceptance, fails to execute such further contractual documents, if any, and give such bond(s) (i.e., performance bonds, payment bonds, delivery, etc.) as may be required within the time specified (ten [10] calendar days if no period is specified) after receipt of the forms by him, then he shall be liable for any cost of procuring the work which exceeds the amount of his bid, and the bid guarantee shall be available toward offsetting such difference.

7.0 PERFORMANCE BOND AND PAYMENT BOND

7.1 Performance bonds are required for bids in excess of $100,000. Payment Bonds are required for bids in excess of $25,000 Gov't Code 2253.021

7.2 .When a performance or payment bond is required, the amounts shall be for 100% of the contract amount (including contingency). Any required bond(s) must be filed with the District within 10 days from the date of the Notice Of Award.

7.3 The only forms of surety acceptable as a performance or payment bond are: Cashier's Check, Certified Check, or a Surety or Blanket Bond from a company chartered or authorized to do business in Texas. Bonds completed (signed) by an out-of-Texas surety require a counter signature by a Texas resident agent of a company chartered or authorized to do business in Texas.

7.4 Bonds and other forms of surety must be made payable to Fort Bend Independent School District.

7.5 Bonds in excess of $100,000 must be from a surety that holds a Certificate of Authority from the United States Department of Treasury or have reinsurance for liability in excess of $100,000 from a United States Treasury listed reinsurer.

7.6 Payment and Performance Bonds must be in accordance with Texas Government Code 2253.

8.0 INSURANCE

Exhibit A

FORT BEND I.S.D. CONSTRUCTION BOND & INSURANCE REQUIREMENTS

It is suggested that this Exhibit be provided to the Contractor's insurance provider.

Contractor shall not commence work until all required bonds and insurance coverages have been obtained and such insurance has been reviewed and accepted by the District. Certificates of Insurance on the current ACORD form shall be issued to the District showing all required insurance coverages.

Bonds Required

Construction, installation and service contracts (including repair and alteration) exceeding $100,000 requires that a 100% Performance Bond be furnished by the successful bidder (contractor). Contracts exceeding $25,000 require that a 100% Payment Bond be furnished by the successful bidder (contractor). All such bids must include a 5% Bid Bond.

Bonds shall be issued by a company authorized to do business in the State of Texas with an A.M. Best Company rating of at least A- X and included on the U.S. Department of the Treasury Listing of Approved Sureties (Dept. Circular 570). The contractor shall be responsible for obtaining bonds and shall absorb any and all costs of such Bonds.

Insurance Required	Limit Required
Automobile Liability insurance covering Any Auto	$1,000,000 Combined Single Limit
Comprehensive (Commercial) General Liability insurance including Products, Completed Operations, Independent Contractors, Broad Form Property Damage, Pollution and Blanket Contractual Liability coverages. XCU exclusions to be removed when underground work is performed.	$1,000,000 Occurrence $2,000,000 Aggregate $1,000,000 Personal Injury $ 500,000 Fire Damage $ 5,000 Medical Payments Per Project Aggregate (CG 70 49) Evidence of coverage must be shown on certificates of insurance.
Professional Errors & Omissions Liability insurance may be required from all contractors and licensed or certified as professionals; e.g., engineers, architects, insurance agents, physicians, attorneys, banks, financial consultants, etc.	One time project amount; $1,000,000 Occurrence & Aggregate minimum, $5,000,000 Maximum Limit Retroactive Date preceding date of contract must be shown Extended Reporting Period three years past completion of contract
Workers Compensation insurance with limits to comply with the requirements of the Texas Worker Compensation Act Employers Liability insurance	Statutory Limits $1,000,000
Umbrella or Excess Liability insurance (excess of primary General Liability, Automobile Liability and WC Coverage B) Applicable to minimum contract amounts **of $100,000**	100% of Contract Amount up to a maximum of $25,000,000. For construction contracts in excess of $25,000,000 higher limits may be required.

Limits for primary policies may differ from those shown when Umbrella or Excess Liability insurance is provided.

10.19.16BC Morrison

All Risk Builders Risk Property Insurance shall be required for all construction contracts when property of the owner is at risk or in the care, custody and control of the Contractor. Builders Risk insurance shall be required for all construction contracts requiring a bond. All Property insurance shall include coverage against the perils of Flood and Earthquake. (Installation Floater may be substituted when contract involves installation only.)	Contract Limit or Replacement Cost Value of Scope of Work whichever is greater Permission to Occupy granted Deductible: 1% of contract, $50,000 maximum, unless otherwise approved by the Owner.

Insurance Conditions

All insurance coverages shall be issued on an Occurrence basis (except Professional Liability) by companies acceptable to District and licensed to do business in the State of Texas by the Texas Department of Insurance. Such companies shall have a Best's Key rating of at least "A- X".

All certificates must include:

1. The location or description and the bid number, CSP number or Purchase Order number
2. A 30 day notice of cancellation of any non-renewal, cancellation or material change to any of the policies
3. "Additional Insured" on the Property, General Liability, Automobile Liability and Umbrella (Excess) Liability policies naming the District.
4. A "Waiver of Subrogation" clause in favor of the District will be attached to the Workers Compensation, General Liability, Automobile Liability, Umbrella Liability and the Property insurance policies.
5. In addition to certificates of insurance, copies of policy endorsements must be provided (a) listing the District as Additional Insured, and (b) showing waivers of subrogation in favor of the District: CG2010, CG2037, CG2404, CA0070, CA0032, WC0003 or their equivalents.

All insurance must be maintained for one year following substantial completion with Certificates of Insurance provided.

Contractor shall be responsible for payment of all deductibles; the District shall approve the deductibles selected.

If any policy has aggregate limits, a statement of claims against the aggregate limits is required.

The District reserves the right to review the insurance requirements during the effective period of any contract to make reasonable adjustments to insurance coverages and limits when deemed reasonably prudent by District based upon changes in statutory laws, court decisions or potential increase in exposure to loss.

FORT BEND Independent School District
C/o Director – Design & Construction Department
2323 Texas Parkway
Missouri City, TX 77489

9.0 EVALUATION CRITERIA AND RELATIVE WEIGHTS

In accordance with Government Code Section 2269.056 the applicable weighted value for each criterion is published in the front pages of the CSP package.

9.1 Proposal Delivery and Organization

Offeror is to organize the Proposal in the following format:

1) To comply with Government code chapter 2269.059 your submittal must be sealed before delivery. Provide the requirements listed below in the order provided.

1.1 Provide with the Proposal Base Bid Form (Submit in Bonfire Proposal Bid Form Section):

- Addenda Acknowledgment Sheet
- Bid Bond
- Proposal Base Bid Form

1.2 Provide the district and statute required forms in Bonfire Under Required Forms Section:

- No Response Form(Optional)
- Contractor Informational Form (Required)
- Contractor Questionnaire (Required)
- Bonding Capacity Certification Letter (Required)
- Proposal Submission Form (Required)
- Non-Collusion Certification (Required)
- Certificate of Residency (Required)
- Affidavit of Non-Discriminatory Employment (Required)
- Contractor Certification (Required)
- Felony Conviction Notification (Required)
- Vendor Debarment Statement (Required)
- Conflict of Interest Questionnaire (Required)
- Certification regarding Lobbying (Required)
- Confidential Copyrighted Information (Required)
- Owner(s) Name of Business (Required)
- Delinquent Taxpayers (Required)
- Identification Number & Certification (Required)
- Fort Bend ISD Contractor and Subcontractor Participation Form (Required)
- Certificate of Interested Parties Form 1295 (Required)
- Forms Certification (Required)
- Per Govt. Code 2270.002, provide written verification that the company does not boycott Israel and will not during the term of the contract.

1.3 For Proposals Formal Submission: Provide in Each Section in Bonfire as listed below. Provide information that details the evaluation response for each of the following criteria. Must be in the location specified in Bonfire.

- Section ONE (**Offeror's Experience and Reputation**)

- Section TWO (**Quality of the Offeror's Goods and Services**)
- Section THREE (**Offeror's Proposed Personnel**)
- Section FOUR (**Other Relevant Factor- Plan and Schedule**)

1.5 **Financial Section** (Submit in Bonfire Offeror's Financial Section) "**Financial stability and bonding capacity**" (all financial information provided in Bonfire is confidential)

1.6 **Safety plan and safety record**" (Submit in Bonfire Safety Manual Section)

1.7 **Alternate Bid Proposal Submission (**Submit in Bonfire Package "B" Section)

- Alternate Bid Proposal Form
- Deviation Form (if Applicable)

1.8 **SBEP commitment**" submission (Submit in Bonfire Package C Section)

9.2 Relative Weights

To determine the best value bidder, the Owner will evaluate the responses and information submitted on the Bid Form, Contractor's Information Statement Form and other bid documents in regards to the following criteria:

1) "The Price"

Texas Government Code 2269.055.a (1) The price.

1.1) Proposed construction contract price (base price plus alternates as defined on the bid form). Contract price shall include both base price and accepted alternate price as defined on the bid form. The final weighting distribution will be a calculated percentage.

1.2) No deviations are allowed in the base bid or base bid adjustment. Any deviation from the Base Bid shall be submitted as Alternate No. 2 on the Deviations Form.

1.3) Evaluation of the proposed substitutes/deviations does not constitute Owner's acceptance of the substitutes/deviations but can be considered during negotiations.

1.4) Price scores will be based on the base bid +/- the base bid adjustment which must be in adherence to all plans and specifications published.

2) "FORMAL SUBMISSION SECTION ONE – "Offeror's Experience and Reputation"

Texas Government Code 2269.055.a (2) The offeror's experience and reputation.

2.1) Provide three (3) letters of reference for projects completed in the past **one (1) year** from major suppliers and/or sub-contractors which specifically address the bidder's history of paying sub-contractors and material providers on time.

2.2) List current or pastFBISD projects completed within the past **five (5) years** of similar scope and size.

2.3) List current or past projects with other school district completed within the **past five (5) years** of similar scope and size.

2.4) Letters of reference from Director of Facilities/Operations/Maintenance & from campus on housekeeping and cleanliness from FBISD and/or other school district

2.5) The district staff will contact the Owners, identified in the list of current of past K-12 projects or Non K-12 projects completed within the **past five (5) years** of similar scope and size. References

may be conducted by FBISD staff to ascertain the following:

- The quality of the work provided by bidder.
- The bidder's history of providing warranty documents.
- The bidder's history of timeliness in completing warranty work.
- The bidder's history of staying on schedule.
- The bidder's cooperative attitude when working with the owner and its architect in resolving construction issues.
- The bidder's history of providing detailed documentation and a fair assessment of change order pricing.
- The bidder's history of repeat business with owner(s).

2.6) Provide a detail of your history of on-time project completion. The district may verify the bidder's history based on references contacted by FBISD Administrative staff.

2.7) List all claims, judgments, arbitration proceedings or suits pending or outstanding against your company or its officers. Summarize the nature of the claims.

3) "FORMAL SUBMISSION SECTION TWO – Quality of the Offeror's Goods and Services"

Texas Government Code 2269.055.a (3) The offeror's experience and reputation

3.1) Include in the proposal; your firms' philosophy on construction management, your sub-contractor selection process, details of managing conflicts, staffing issues, subcontractor disputes. Include your plan for operating on an occupied school site. Include your system for coordination with local jurisdictions, your methodology for quality control. Provide a statement in your work flow plan that indicates scheduling and timing of site meeting, coordination with owners, documentation, and your firm's unique ability to satisfy the client. Include a project schedule/timeline with project specific parameters or limitations (e.g. evening, summer, holiday work).

3.2) Provide evidence of sufficient resources necessary to manage, staff and successfully perform the Work.

3.3) The bidder's history of on-time project success

3.4) Provide a sample quality management plan that would include your role in substantiating conformance with the contract documents. Include in the plan your performance history for: quality assurance/quality control, preconference processes, process for documenting and correcting nonconforming work, as well as the process and staff that would oversee this plan.

3.5) Provide cost saving ideas and associated cost.

3.6) Provide details of firms PMCS capabilities, include familiarity with major software packages, CAD coordination, and electronic filling, submissions, and transmittals.

4) Utilization of historically underutilized businesses

Texas Government Code 2269.055.a (4). Not Applicable

5) Offeror's Safety Record – "Safety plan and safety record"

Texas Government Code 2269.055.a (5) The offeror's safety record.

5.1 Provide your company's safety program manual. (see submission process in section A above)

5.2 Provide OSHA No. 300 Log information for the past three (3) years regarding following points:

- Number of injuries and illnesses
- Number of lost time accidents
- Number of recordable cases
- Number of fatalities
- Number of employee direct hire fixed hours worked (round to 1,000's)

5.3 Provide your company's safety orientation program for new employees.

5.4 State the frequency and provide evident of ongoing safety inspections as implemented in current projects.

5.5 Provide your company's drug/alcohol prevention policy.

6) "FORMAL SUBMISSION SECTION THREE – "Offeror's Proposed Personnel"

Texas Government Code 2269.055.a (6) The offeror's proposed personnel – Resumes, experience, certifications, past specific experience with similar scope.

6.1 List individuals and provide detailed resumes of the positions for Project Manager, Assistant Project Manager, Project Superintendent, Assistant Project Superintendent and MEP Quality Control Specialist who will be assigned for the entire duration of the Project. Resumes should address the following points for each of the positions mentioned above.

- Amount of time assigned to project;
- Years of experience;
- Current project assignment and availability for this project
- Relevant K-12 experience;
- Certifications
- Include project available dates for key staff

7) "Offeror's Financial Capability Appropriate to the Size and scope of the Project"

Texas Government Code 2269.055.a (7) whether the offeror's financial capability is appropriate to the size and scope of the project

7.1 Submit Bond on FBISD mandated form.

7.2 Provide your company's single limit coverage.

7.3 Provide your company's aggregate/total available limit of coverage.

7.4 List your surety company and address following points.

- Years your company has had a business relationship with surety;
- AM Best Rating;
- Identify if surety company is registered in the State of Texas.

7.5 List projects your company has in progress. For each project listed address the following points.

- Name of project;
- Owner's contact person and phone number;
- Architect, Architect's contact person and phone number;
- Contract amount;
- Percent complete;
- Scheduled completion date;
- List total worth of work in progress and under contract.

7.6 Provide a recent financial statement for the organization that is proposing.

7.7 The financial statement should be attested to by a CPA, an Audit is preferred, a Review is acceptable, or a Compilation at a minimum.

AUDIT

- provides the highest level of assurance on an organization's financial statement

REVIEW

- provides limited assurance on an organization's financial statements

COMPILATION

- provides no assurance on an organization's financial statement

7.8 The Financial Statement must address the following points:

- Your organization's latest balance and income statement showing current assets, net fixed assets, other assets, current liabilities and other liabilities;
- Indicate name and address of firm preparing financial statement, and date thereof;
- If the financial statement is not for the identical organization submitting offer, explain the relationship and financial responsibility of the organization whose financial statement is provided (parent, subsidiary, etc.)

7.9 If available, please list your company's Dunn & Bradstreet risk rating.

8) "SUBMIT IN BONFIRE PACKAGE "C" – "SBEP commitment"

Texas Government Code 2269.055.b (2) Any other relevant factor specifically listed in the request for bids or proposals.

8.0 Provide your Small Business Enterprise Program Proposal packet.

8.1 Small Business Enterprise Program

8.1.1 Owner has adopted a Small Business Enterprise Program to provide increased business opportunities for locally certified small businesses to competitively participate in contracting and procurement within FBISD. See FBISD Board Policy CV(Local), and the FBISD Small Business Enterprise Program.

8.1.2 Small Business Practices:

8.1.2.1 Describe your previous experience, involvement and approach in working with certified Small Business firms; including level of effort, division of duties and providing opinions. Provide a statement detailing small business participation commitment.

8.1.2.2 For this Project FBISD has a small business participation goal of Twenty-Five Percent (25%).

8.1.2.3 At a minimum, your response must include: (a) Firm's commitment to meeting the small business participation goal for the project (b) a description of previous projects where your firm has successfully subcontracted work to small businesses including the percentage (%) of work subcontracted to these firms under each project; (c) a narrative outlining your overall approach to subcontracting and how you will solicit small businesses for participation as part of this Project; and (d) indicate what challenges you anticipate in attaining FBISD's goal.

8.1.2.4 Describe your company's process for the selection of subcontractors in accordance with the statutory procedures required for the solicitation of subcontractors under a Construction Manager-at-Risk delivery method, including your process for evaluating subcontractors' performance while also incorporating a Small Business Development Program.

8.1.2.5 Provide a reference list of all customers noted in Past Performance References that included a Small Business or similar program where you have performed work similar to the type of work described in this CSP. Provide the contact person and the representative who served as the Small Business Development liaison, telephone number and email address.

8.1.2.6 If, in the opinion of the Evaluation Committee, the Proposal Response completely meets the stated small business participation goals, the total amount of eligible points will be awarded for small business participation, as indicated below.

Proposed SBE Subcontracting	Available Points
Less than 5%	0
5% - 9%	1
10% - 14%	2
15% - 19%	3
20% - 24%	4
25% or more	5

8.1.3 Points shall be awarded in accordance with the Proposal Response based on the prime vendor's commitment to small business subcontracting stated in the solicitation document and the published point distribution sliding scale.

8.1.4 If the proposer itself is a certified Small Business who plans to self-perform work, the value of such self-performed work shall be included in calculating the eligible points for small business participation to the Small Business Proposer, in addition to the value of work subcontracted to another small business.

8.1.5 If the proposer itself is a not a certified Small Business, but has join-ventured with another certified Small Business, only the value of work to be self-performed by the certified Small Business Prime contractor will be included in calculating the eligible points for small business

participation to the Small Business Proposer/joint venture, in addition to the value of work subcontracted to another small business.

8.1.6 Once selected, all prime construction contractors ("Contractor") working with FBISD on SBEP eligible construction projects shall be required to submit the Fort Bend ISD Subcontractor Progress Assessment Form with each application for payment, requesting payment be made for Work performed by a subcontractor that qualifies as a "small business" under FBISD Board Policy CV (Local). The Contractor shall also ensure that, once Contractor makes the applicable payment to the Small Business Subcontractor, the Subcontractor completes the Fort Bend ISD Subcontractors/Subcontractors/Suppliers Payment Certification Form in its entirety. Contractor agrees to submit the completed copies to Owner with the next application for payment. The completed Fort Bend ISD Subcontractors/Subcontractors/Suppliers Payment Certification Form must be received by the Owner before any further payment will be made to Contractor for any Work performed.

8.1.7 Include with your submission the SBEP Participation Report

8.1.8 Include with your submission the Supplier Diversity Questionnaire

9.0 Award of the Contract

1.1 The Bidder to whom the award is made will be promptly notified. If a Bidder (a) withdraws his bid within 45 days after the date of time fixed for the opening of bids in the Request for Competitive Sealed Bids, or (b) fails or refuses to execute the Agreement, or other required forms within ten (10) calendar days after the same are presented to him for signature, or (c) fails or refuses to furnish properly executed Performance Bond and Certification of Required Insurance within 10 calendar days of Notice of Award of the Project, the Owner may award the work to another Bidder or Bidders or, if applicable, may call for new bids.

2.2 The Bidder will be required to (a) submit his bid and Bid Bond, (b) execute Contract and Performance and Payment Bonds, and (c) submit Certification of required insurances.

1.3 Bid Bond is forfeited if bid is withdrawn after the CSP opening, or Contract Documents are not executed in accordance with the above.

10.0 SUBMISSION OF POST COMPETITIVE SEALED COMPETITIVE INFORMATION

The selected Bidder shall within ten (10) days after the Board of Trustees approves the award submit the following:

10.1 A designation of the work to be performed by the Bidder with his own forces.

10.2 An experience profile of the selected Bidder's superintendent scheduled to work on this project. In addition, the apparent selected Bidder shall cooperate with the Owner, supplying requested information to substantiate the qualifications of the superintendent. If, in the opinion of the Owner, the superintendent does not qualify, the Owner may request the submission of another superintendent and more information. The Owner reserves the right to reject the apparent selected Bidder if an acceptable superintendent is not presented.

10.3 A list of names of subcontractors or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for such portions of the work as may be designated in the bid documents or, if no portions are so designated, the names of the subcontractors proposed for the principal portions of the work.

10.4 The selected Bidder shall within ten (10) days thereafter submit a statement of costs for each major item of work included in the bid. Each section of specifications will be considered a major item of work and shall be shown as a separate cost item.

11.0 NOTICE TO PROCEED

11.1 The Bidder shall not commence work under this Contract until he receives the written Notice to Proceed and the Contract is duly signed by the Owner.

12.0 COMPLETION TIME

12.1 The Owner has a critical need for the work to begin timely and be Substantially Complete by date provided on the Bid Form.

12.2 Having thoroughly familiarized himself with the conditions as they exist at the building sites and acquainted himself with the labor supply and the material market, the Bidder will state in his bid that he agrees to be substantially complete with the work by the date above.

12.3 Under the Base Bid, the successful Bidder will be subject to liquidated damages.

12.4 The definition of Substantial Completion, as defined in Article 9.8.1 of the AIA General Conditions and Supplementary Conditions bound herein, is as follows: "Substantial Completion is the stage in the progress of the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use".

13.0 RETAINAGE

13.1 Contracts will bear a retainage of five (5) percent (%) on each partial disbursement.

14.0 ASBESTOS, LEAD AND PCBs CONTAINING MATERIALS

14.1 The use of any construction process or the installation of any asbestos, lead and PCBs or material containing asbestos, lead and PCBs is strictly prohibited for this Project.

14.2 Prior to submitting a bid, Bidders shall notify the Project Manager, in writing, of any materials in these specifications which are known to contain or are likely to contain asbestos, lead or PCBs.

14.3 Prior to payment of retainage and final payment the Contractor shall furnish a notarized statement certifying that no asbestos, lead and PCBs containing materials have been used in the Project.

14.4 In addition to the Contractor's notarized statement, the Subcontractors will be required to furnish notarized affidavits that no asbestos, lead, and PCBs containing products have been used in this Project.

15.0 AVAILABILITY OF MATERIALS AND SYSTEMS

15.1 A serious effort has been made to select only materials that are asbestos free and systems that are readily available. As far as is known at bid time all items are either available "off the shelf" or within a relatively short period of time. If during the bid period, an Bidder becomes aware of an availability or delivery problem with any of the specified systems or materials or if they contain asbestos, he should notify the Project Manager immediately. The Project Manager will promptly explore possibilities for selecting other systems or materials which would circumvent the problem and notify Bidders of any changes in an addendum, otherwise it will be understood that only specified systems and materials that are asbestos free are included in the bids.

16.0 USE OF ASBESTOS FREE MATERIALS, PRODUCTS AND SYSTEMS

16.1 The Contractor is reminded to refer to the Section above for requirements during the bid period and the following requirements during performance of the Work regarding the use of asbestos free materials, products and systems in the Project.

16.2 Since many materials, products and systems are proprietary, it is not possible to know all of the materials or components which go into producing such material, product or system without the manufacturer divulging trade secrets or patent information. Every effort has been made to specify materials, products or systems, which either as an "off the shelf" material, product or system or as a custom material, product or system do not contain asbestos.

16.3 It is the Contractor's responsibility to submit an affidavit from the manufacturer to ascertain that every material, product or system used in the Project does not contain asbestos. In the event the material, product or system is found to contain asbestos, the Contractor shall offer for the Project Manager's consideration a substitution which he knows does not contain asbestos.

16.4 Even though a material, product or system is specified or a specification is based on a particular material, product or system, the Contractor will not be relieved from the responsibility to ascertain that materials, products and systems used in the Project do not contain asbestos. Under no circumstances shall a material, product or system which is known, suspected or found to contain asbestos be used on the project.

16.5 If a material, product or system containing asbestos is used, the Contractor shall remove and replace the material, product or system with one which is asbestos free at no additional expense to the Owner, including removal and replacement of other materials affected by the removal of the asbestos bearing material, product or system, i.e. gypsum wallboard removed, replaced, and repainted on account of insulation being removed, etc

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Clarification for Package B of Fort Bend ISD CSP

Package A – Base Bid and All Documents EXCEPT Alternates and SBE Documents

Package A should include the contractor's base bid for the project on the Base Bid Form

Package B – Alternates and Base Bid Adjustment (correction)

Package B should include the following on the Alternate Form:

- The bidder's **alternate bids** as requested by the District. If a bidder does not submit alternate pricing, they will be disqualified as a non-responsive bidder.

- The bidder's **base bid adjustment** to their original base bid submitted in Package A.

- **Deviations** should not be included in the base bid or base bid adjustment.

  Bidder should enter the amount the District may ADD to or DEDUCT from their base bid submitted in Package A. For example, if the bidder submitted a base bid in Package A as $10,000,000 but realized they should have submitted the base bid as $10,500,000, then the bidder would insert an ADD in the Base Bid Adjustment line as $500,000.

  The **Purchasing Department** will calculate Base Bid (Package A) plus/minus Base Bid Adjustment (Package B) to obtain the FINAL Base Bid for the CSP.

- No deviations are allowed in the base bid or base bid adjustment. Any deviation from the Base
- Bid shall be submitted as Alternate No. 2 on the Deviations Form. Evaluation of the proposed substitutes/deviations does not constitute Owner's acceptance of the substitutes/deviations but can be considered during negotiations

  Form Instructions:

  Add: Provides the amount Purchasing should add to the original base bid reflected in Package A

  Deduct: Provides the amount Purchasing should deduct from the original base bid reflected in Package A

  No change: Means that there is no change to your base bid price reflected in Package A

  Not Applicable (NA): Means that there is no change to your base bid price reflected in Package A

FBISD
INSPIRE • EQUIP • IMAGINE
BUSINESS & FINANCE

CONFLICT OF INTEREST QUESTIONNAIRE

All vendors doing business with Fort Bend Independent School (FBISD) must complete and submit a Conflict of Interest Questionnaire (CIQ).

FBISD is required to comply with Texas Local Government Code Chapter 176, Disclosure of Certain Relationships with Local Government Officers. Any company that does business with FBISD must complete and submit a Conflict of Interest Questionnaire (CIQ) whether or not a conflict of interest exists.

Statements must be filed within seven (7) business days after the officer becomes aware a conflict of interest exists.

FBISD Board of Trustees include:

Ms. Kristin K. Tassin, President

Mr. Adam Schoof

Dr. Shirley Rose Gilliam

Ms. Angie Hanan

Ms. Sonya Jones

Mr. Rick Garcia, Vice President

Mr. David Hamilton, Secretary

Dr. Marc Smith, Superintendent

Current Local Government Officers includes:

Kathleen Brown, Deputy Superintendent

Dr. Jaretha Jordan, Deputy Superintendent

Beth Martinez, Deputy Superintendent

Coby Wilbanks, General Counsel

Glenda Johnson, Chief Human Resources Officer

David Rider, Chief of Police

Kwabena Mensah, Chief of Staff

Damian Viltz, Chief Operations Officer

Rhonda Mason , Asst Superintendent Elem

Dr. Stephen Warford, Asst Superintendent Sec

Antignolo Matthew, Exec Dir Child Nutrition

Pandit Payal, Exec Dir Collab Communities Daniel

Bankhead, Exec Dir D & Construction Nunez

Wendy, Exec Dir Elementary Schools Mason

Rhonda, Exec Dir Elementary Schools

Ford Ida, Exec Dir Elementary Schools

Dr. Adam Stephens, Chief Academic Officer

kimberly Smith, Chief Communications Officer

Bryan Guinn, Chief Financial Officer

Long Pham, Chief Information Officer Morgan

Aaron, Exec Dir Facilities

Schlacks Kelly, Exec Dir Finance

Amber Williams, Exec Dir HR

Jojo Jacob Exec Dir Info Systems

Christopher Nilsson, Exec Dir Info Tech Service

Dr. Andria Schur, Chief of Schools

Williams Stephanie, Exec Dir Org Development

Elizabeth Williams, Exec Dir Secondary Schools

Lyons-Lewis, Deidra Exec Dir Sec. Schools

Westbrook Pilar, Exec Dir Sel & Comp.Health

Lisa Langston Exec Dir Student Affairs

Hill Deena, Exec Dir Student Supp Svc

Hubbard Melissa, Exec Dir Teach & Learning

Richard Gay, Exec. Dir. Business Services

HOW TO COMPLETE THE CIQ FORM

NO CONFLICT EXIST

If no conflict of interest exists, you MUST:

1. Fill out Box 1
2. Type N/A on Box 3 of the CIQ form
3. Sign and date

CONFLICT EXIST

If a conflict of interest exists, you MUST:

1. Name of person doing business with the District. If the business is a corporation, partnership, etc., then each person who acts as an agent for the business in dealings with Fort Bend ISD must complete the form. Also, state company name. If no conflict of interest exists, you must fill out Box 1 and type N/A on Box 3 of the CIQ form, sign and date it.
2. Check the box if you are filing an update to a previously filed questionnaire. Updates are required by law by September 1 of each year in which the person submits a proposal or bid or begins contract discussions or negotiations with the District. Updates are also required by the 7th business day after an event that makes a statement in a previously filed questionnaire incomplete or inaccurate.
3. Name the District employee or school board member with whom you have a relationship, if there is no relationship in question, state “NONE”.
4. Answer questions A and B with “Yes” or “No”, as applicable.
5. Describe how you are affiliated or related to a FBISD employee or school board member.
6. Check Box if applicable
7. Signature Box: Date and Sign the form. A signature is required from the person completing the form even if “No” is entered in Box 3, A, B, C, or D.

CONFLICT OF INTEREST QUESTIONNAIRE
For vendor doing business with local governmental entity

A complete copy of Chapter 176 of the Local Government Code may be found at http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm. For easy reference, below are some of the sections cited on this form.

Local Government Code § 176.001(1-a): "Business relationship" means a connection between two or more parties based on commercial activity of one of the parties. The term does not include a connection based on:

(A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or an agency of a federal, state, or local governmental entity;

(B) a transaction conducted at a price and subject to terms available to the public; or

(C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency and that is subject to regular examination by, and reporting to, that agency.

Local Government Code § 176.003(a)(2)(A) and (B):

(a) A local government officer shall file a conflicts disclosure statement with respect to a vendor if:

***

(2) the vendor:

(A) has an employment or other business relationship with the local government officer or a family member of the officer that results in the officer or family member receiving taxable income, other than investment income, that exceeds $2,500 during the 12-month period preceding the date that the officer becomes aware that

(i) a contract between the local governmental entity and vendor has been executed; or

(ii) the local governmental entity is considering entering into a contract with the vendor;

(B) has given to the local government officer or a family member of the officer one or more gifts that have an aggregate value of more than $100 in the 12-month period preceding the date the officer becomes aware that:

(i) a contract between the local governmental entity and vendor has been executed; or

(ii) the local governmental entity is considering entering into a contract with the vendor.

Local Government Code § 176.006(a) and (a-1)

(a) A vendor shall file a completed conflict of interest questionnaire if the vendor has a business relationship with a local governmental entity and:

(1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);

(2) has given a local government officer of that local governmental entity, or a family member of the officer, one or more gifts with the aggregate value specified by Section 176.003(a)(2)(B), excluding any gift described by Section 176.003(a-1); or

(3) has a family relationship with a local government officer of that local governmental entity.

(a-1) The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

(1) the date that the vendor:

(A) begins discussions or negotiations to enter into a contract with the local governmental entity; or

(B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

(2) the date the vendor becomes aware:

(A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);

(B) that the vendor has given one or more gifts described by Subsection (a); or

(C) of a family relationship with a local government officer.

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.** (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information is being disclosed.**

_____

Name of Officer

4 **Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.**

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☐ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

5 **Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.**

6 ☐ Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

_____ _____

Signature of vendor doing business with the governmental entity Date

Statute / District Required Forms:

- **No Response Form** ***(Optional)***
- **Contractor Informational Form** ***(Required)***
- **Contractor Questionnaire** ***(Required)***
- **Bonding Capacity Certification Letter** ***(Required)***
- **Proposal Submission Form** ***(Required)***
- **Non-Collusion Certification** ***(Required)***
- **Certificate of Residency** ***(Required)***
- **Affidavit of Non-Discriminatory Employment** ***(Required)***
- **Contractor Certification** ***(Required)***
- **Felony Conviction Notification** ***(Required)***
- **Vendor Debarment Statement** ***(Required)***
- **Conflict of Interest Questionnaire** ***(Required)***
- **Certification regarding Lobbying** ***(Required)***
- **Confidential Copyrighted Information** ***(Required)***
- **Owner(s) Name of Business** ***(Required)***
- **Delinquent Taxpayers** ***(Required)***
- **Fort Bend ISD Contractor and Subcontractor Participation Form** ***(submit with SBE Requirements)***
- **Certificate of Interested Parties** ***(Required)***
    - **INSTRUCTIONS for Form 1295 (Certificate of Interested Parties)**
- **Forms Certification** ***(Required)***
- **Per Govt. Code 2270.002, written verification that the company does not boycott Israel and will not during the term of the contract** ***(Required)***
- **Addendum Acknowledgment Form (*Required*)**

No Response Form *(Optional)*

RETURN ONLY IF YOU CHOOSE NOT TO SUBMIT A RESPONSE TO THIS SOLICITATION

CSP _____

TITLE of CSP _____

Please Print

Whereas on the _____ day of _____, 2024 (print name of company)

_____

has reviewed FBISD's solicitation and elects not to submit a bid:

State Reason for no bid:_____

_____

_____

_____

Street Address

_____

City, State, Zip Code

_____

Telephone/Fax Number

_____

Name of Authorized Individual

_____

Signature of Authorized Individual

Contractor Informational Form *(Required)*

CONTRACTOR IS:

An Individual

By _____
Individual's Name

A Partnership

_____
Firm Name

By_____
General Partner Authorized to Sign

A Corporation

By_____
Corporation Name

_____
State of Incorporation

By_____
Name of Person Authorized to Sign

_____
Title

(Corporate Seal)

Attest_____
Secretary

Contractor Questionnaire *(Required)*

Bidder:_____

1. Are you using subcontractors? Yes_____No____

2. Have you ever performed work for Fort Bend ISD or other ISDs as a subcontractor? Yes _____ No_____. If the answer is yes, please provide name of Contractor and Project(s) you were subcontracted to.

   _____

   _____

   _____

3. Can you provide proof of liability and worker's compensation coverage? Yes_____No_____

4. Did you include the most recent up to date references in this packet? Yes_____ No_____

5. Please include similar projects that you have completed for Texas ISDs in the past 12 months.

   _____

   _____

   _____

   _____

PROPOSAL SUBMISSION FORM

CSP _____

Title of CSP_____

Please Print

Whereas on the _____ day of _____, 2024

(print name of company) _____ has reviewed

CSP # _____

A copy may be obtained at http://www.fortbendisd.com/docs/purchasing/general-provisions-for-purchasing-solicitations-and-contracts.pdf or by contacting the Fort Bend ISD Buyer listed on the cover sheet. Any exception to the terms and conditions must be included in the Proposer's response.

Texas Education Code 44.031(a)(5); Texas Government Code 2269
***Purchasing and Acquisition,* FBISD Policy CH (Legal)**
***Purchasing and Acquisition,* FBISD Policy CH (Local)**
***Facilities and Construction,* FBISD Policy CV (Legal)**
***Facilities and Construction,* FBISD Policy CV (Local)**

_____	_____
Street Address	***City, State, Zip Code***
_____	_____
Telephone Number	***Fax Number***
_____	_____
Name of Authorized Individual	***Signature of Authorized Individual***

Non-Collusion Certification *(Required)*

The undersigned affirms that he or she is duly authorized to execute this questionnaire, that this company, corporation, firm, partnership, or individual has not prepared this submission in collusion with any other person, firm, or entity making or considering making a submission to FBISD for any of the future District projects, and that the contents of this submission as to prices, terms or conditions of said submission have not been communicated by the undersigned nor by any employee or agent to any other person engaged in this type of business prior to the official opening of this submission.

The foregoing is true and correct. FBISD, or any authorized representative of FBISD, is authorized by the undersigned to contact any firm, institution, or person listed above to obtain information which FBISD might determine as being desirable.

Firm: _____

Address: _____

City/State/Zip: _____

Phone No: _____

Fax No: _____

Signature: _____

Typed Name: _____

Date: _____

Certificate of Residency *(Required)*

The State of Texas has passed a law concerning non-resident contractors. This law can be found in Texas Government Code under Chapter 2252, This law makes it necessary for FBISD to determine the residency of its proposers. In part, this law reads as follows:

"Section: 2252.001
(3) 'Non-resident bidder' refers to a person who is not a resident.

(4) 'Resident bidder' refers to a person whose principal place of business is in this state, including a contractor whose ultimate parent company or majority owner has its principal place of business in this state.

Section: 2252.002
A governmental entity may not award a governmental contract to a nonresident bidder unless the nonresident underbids the lowest bid submitted by a responsible resident bidder by an amount that is not less than the amount by which a resident bidder would be required to underbid the nonresident bidder to obtain a comparable contract in the state in which the nonresident's principal place of business is located."

I certify that _____
(Name of Company Bidding)

is, under Section: 2252.002, 003 and 004, a

_____ Resident Bidder _____ Non-resident Bidder

My or Our principal place of business under Section: 2252.002, 003, and 004, is in the city of

_____ in the state of _____

_____
Signature of Authorized Company Representative

_____
Print Name

_____ _____
Title Date

Affidavit of Non-Discriminatory Employment *(Required)*

(Tracking purposes only)

FORT BEND INDEPENDENT SCHOOL DISTRICT

This company, Contractor, or Subcontractor agrees to refrain from discrimination in terms and conditions of employment on the basis of race, color, religion, sex, or national origin, and agrees to take affirmative action as required by Federal Statutes and rules and regulations issued pursuant thereto in order to maintain and insure non-discriminatory employment practices.

_____

Signature

_____

Printed Name & Title

_____

Company

Contractor Certification *(Required)*

Introduction: Texas Education Code Chapter 22 requires entities that contract with school districts to obtain criminal history records on covered employees. Covered employees with disqualifying criminal histories are prohibited from serving at a school district. Contractors must certify to the district that they have complied and must obtain similar certifications from their subcontractors.

Definitions:
Covered individuals: Individual who have or will have continuing duties related to the service to be performed and have or will have direct contact with students. The District will be the final arbiter of what constitutes direct contact with students.

Disqualifying criminal history: (1) a conviction or other criminal history information designated by the District; (2) a felony or misdemeanor offense that would prevent a person from obtaining certification as an educator under Texas Education Code § 21.060, including 19 Tex. Admin. Code §249.16; or (3) one of the following offenses, if at the time of the offense, the victim was under 18 or enrolled in a public school: (a) a felony offense under Title 5, Texas Penal Code; (b) an offense for which a defendant is required to register as a sex offender under Chapter 62, Texas Code of Criminal Procedure; or (c) an equivalent offense under federal law or the laws of another state.

On behalf of _____ ("Contractor"), I certify that [check one]:

[ ] None of Contractor's employees are *covered individuals*, as defined above. If this box is checked, I further certify that Contractor has taken precautions or imposed conditions to ensure that Contractor's employees will not become *covered individuals*. Contractor will maintain these precautions or conditions throughout the time the contracted services are provided.

Or

[ ] Some or all of Contractor's employees are *covered individuals*. If this box is checked, I further certify that:

1. Contractor has obtained all required criminal history record information regarding its covered individuals. None of the covered individuals has a disqualifying criminal history.

2. If Contractor receives information that a covered individual subsequently has a reported criminal history, Contractor will immediately remove the covered individual from contract duties and notify the District in writing within three business days.

3. Upon request, Contractor will provide the District with the name and any other requested information of covered individuals so that the District may obtain criminal history record information on the covered individuals.

4. If the District objects to the assignment of a covered individual on the basis of the covered individual's criminal history record information, Contractor agrees to discontinue using the covered individual to provide services at the District.

Noncompliance or misrepresentation regarding this certification may be grounds for contract termination.

_____ _____
Signature Date

Felony Conviction Notification *(Required)*

State of Texas Legislative Senate Bill No. 1, Section 44.034, Notification of Criminal History, Subsection (a), states "a person or business entity that enters into a contract with a school district must give advance notice to the district if the person or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony".

Subsection (b) states "a school district may terminate a contract with a person or business entity if the district determines that the person or business entity failed to give notice as required by Subsection (a) or misrepresented the conduct resulting in the conviction. The District must compensate the person or business entity for services performed before the termination of the contract".

This Notice is Not Required of a Publicly-Held Corporation.

I, the undersigned agent for the firm named below, certify that the information concerning notification of felony convictions has been reviewed by me and the following information furnished is true to the best of my knowledge.

Vendor's Name:

Authorized Company Official's Name (Printed):

A. My firm is a publicly held corporation; therefore, this reporting requirement is not applicable.

Signature of Company Official:

B. My firm is not owned or operated by anyone who has been convicted of a felony.

Signature of Company Official:

C. My firm is owned or operated by the following individual(s) who has/have been convicted of a felony:

Name of Felon(s): _____

Details of Conviction(s): _____

_____

Signature of Company Official:_____

Vendor Debarment Statement *(Required)*

I have read the conditions and specifications provided in the bid document attached.

I affirm, to the best of my knowledge, the company I represent has not been debarred or suspended from conducting business with school districts in the State of Texas. This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 7 CFR Part 3017, Section 3017.510, Participants' responsibilities. The regulations were published as Part IV of the January 30, 1989, Federal Register (pages 4722-4733). Copies of the regulation may be obtained by contacting the Department of Agriculture Agency with which this transaction originated.

_____

NAME OF COMPANY (Please Type)

_____

MAILING ADDRESS CITY STATE ZIP

_____

PREPARED BY (Please Type)

_____ _____

SIGNATURE TITLE

_____ _____

TELEPHONE NUMBER FAX NUMBER DATE

Check here if you have an address or telephone number change: Yes____ No____

Conflict of Interest Questionnaire *(Required)* COMPLETE AND SIGN EVEN IF NO CONFLICT EXISTS

CONFLICT OF INTEREST QUESTIONNAIRE FORM CIQ

For vendor or other person doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

OFFICE USE ONLY

Date Received

This questionnaire is being filed in accordance with Chapter 176, Local Government Code by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the person meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006, Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

1 **Name of vendor who has a business relationship with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.**

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information is being disclosed.**

Name of Officer

This section (item 3 including subparts A, B, C & D) must be completed for each officer with whom the vendor has an employment or other business relationship as defined by Section 176.001(1-a), Local Government Code. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☐ No

B. Is the vendor of the questionnaire receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer named in this section AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

C. Is the filer of this questionnaire employed by a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership of one percent or more?

☐ Yes ☐ No

D. Describe each employment or business relationship with the local government officer named in this section.

Signature of vendor doing business with the governmental entity

Date

RETURN THIS DOCUMENT IN FRONT OF ORIGIONAL SUBMISSION PACKAGE

Certification regarding Lobbying *(Required)*

CERTIFICATION FOR CONTRACTS, GRANTS, LOANS, AND COOPERATIVE AGREEMENTS

The undersigned certifies, to the best of his or her knowledge and belief, that:

1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of a Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying", in accordance with its instruction.

3) The undersigned shall require that the language of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, sub grants and contracts under grants, loans, and cooperative agreements) and that all sub recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, US Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

_____	_____
Company	Authorized Representative (Print)
_____	_____
Signature	Date

Confidential Copyrighted Information *(Required)*

General Provisions Part III Paragraph 13

FBISD is a governmental body subject to the Texas Public Information Act. Solicitation Responses submitted to FBISD as a result of this Solicitation may be subject to release as public information after contracts are executed or the procurement is terminated. If a Vendor believes that its Solicitation Response, or parts of its Solicitation Response, may be exempted from disclosure under Texas law, the Vendor must specify page-by-page and line-by-line the parts of the Solicitation Response which it believes are exempt. In addition, the Vendor must specify which exception(s) to the Texas Public Information Act are applicable and provide detailed reasons to substantiate the exception(s). Vague or general claims to confidentiality will not be accepted. FBISD assumes no obligation or responsibility relating to the disclosure or nondisclosure of information submitted by Vendor.

By signing below, the Bidder agrees, if a bid is, or parts of bid is confidential, the bidder has specified by stamping in bold letters the term **"CONFIDENTIAL"** on all or the confidential part of the bid. The bid may be considered public information even though all or parts are marked confidential. Furthermore, Bidder agrees a copyrighted bid is unacceptable and will be disqualified as unresponsive.

_____	_____
Company	Authorized Representative (Print)
_____	_____
Signature	Date

Owner(s) Name of Business *(Required)*

Bidder certifies the owner(s) name of the business submitting bid is/are: (Please print name(s) below. If not applicable, please indicate N/A.)

Name	Title
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Delinquent Taxpayers *(Required)*

In accordance with law, the District shall not enter into a contract or other transaction with a person indebted to the District, nor shall the District award a contract to or enter into a transaction with an apparent low bidder or successful proposer indebted to the District.

[ ] I am not a delinquent taxpayer to Ft Bend ISD

[ ] I am a delinquent taxpayer to Ft Bend ISD *(your bid may be disqualified if your debt is not cleared prior to award.)*

_____

Signature

_____

Printed Name & Title

_____

Company

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY

1 **Name of business entity filing form, and the city, state and country of the business entity's place of business.**

2 **Name of governmental entity or state agency that is a party to the contract for which the form is being filed.**

3 **Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the goods or services to be provided under the contract.**

4 Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
		Controlling	Intermediary

5 **Check only if there is NO Interested Party.** ☐

6 **AFFIDAVIT**

I swear, or affirm, under penalty of perjury, that the above disclosure is true and correct.

_____
Signature of authorized agent of contracting business entity

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said _____, this the _____ day of _____, 20 _____, to certify which, witness my hand and seal of office.

_____ _____ _____
Signature of officer administering oath | Printed name of officer administering oath | Title of officer administering oath

ADD ADDITIONAL PAGES AS NECESSARY

Form provided by Texas Ethics Commission www.ethics.state.tx.us Adopted 10/5/2015

FBISD CERTIFICATE OF INTERESTED PARTIES – FORM 1295

Certificate of Interested Parties (Form 1295 – must be filled out electronically with the Texas Ethics Commission's online filing application, printed out, signed, notarized, and attached to vendor's response to this solicitation.)

Fort Bend ISD ("FBISD") is required to comply with House Bill 1295, which amended the Texas Government Code by adding Section 2252.908, Disclosure of Interested Parties. Section 2252.908 prohibits FBISD from entering into a contract resulting from this RFP with a business entity unless the business entity submits a Disclosure of Interested Parties (Form 1295) to FBISD at the time business entity submits the signed contract. The Texas Ethics Commission has adopted rules requiring the business entity to file Form 1295 electronically with the Texas Ethics Commission.

"Interested Party" means a person:

a) who has a controlling interest in a business entity with whom FBISD contracts; or
b) who actively participates in facilitating the contract or negotiating the terms of the contract, including a broker, intermediary, adviser, or attorney for the business entity.

"Business Entity" means an entity recognized by law through which business is conducted, including a sole proprietorship, partnership, or corporation.

"Controlling Interest" means (1) an ownership interest or participating interest in a business entity by virtue of units, percentage, shares, stock, or otherwise that exceeds 10 percent; (2) membership on the board of directors or other governing body of a business entity of which the board or other governing body is composed of not more than 10 members; or (3) service as an officer of a business entity that has four or fewer officers, or service as one of the four officers most highly compensated by a business entity that has more than four officers.

As a "business entity," all vendors must electronically complete, print, sign, notarize, and submit Form 1295 with their proposals even if no interested parties exist.

Proposers must file Form 1295 electronically with the Texas Ethics Commission using the online filing application, which can be found at https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm. Proposers must use the filing application on the Texas Ethics Commission's website to enter the required information on Form 1295. Proposers must print a copy of the completed form, which will include a certification of filing containing a unique certification number. The Form 1295 must be signed by an authorized agent of the business entity, and the form must be notarized.

The completed Form 1295 with the certification of filing must be filed with FBISD by attaching the completed form to the vendor's solicitation response.

FBISD must acknowledge the receipt of the filed Form 1295 by notifying the Texas Ethics Commission of the receipt of the filed Form 1295 no later than the 30th day after the date the contract binds all parties to the contract. After FBISD acknowledges the Form 1295, the Texas Ethics Commission will post the completed Form 1295 to its website with seven business days after receiving notice from FBISD.

Forms Certification *(Required)*

I, the undersigned authorized agent for the company named below, certify that the information concerning notification of felony convictions, Owner(s) Name of Business and Delinquent Taxpayers has been reviewed by me and the information furnished is true to the best of my knowledge. I further certify that I agree to comply with Section 22.0834. Criminal History Record Information Review of Certain Contract Employees, Texas Education Code if awarded a contract through this solicitation, the 31 U.S.C. 6101, note, E.O. 12549, E.O. 12689, 48 CFR 9.404 in relation to the Lists of Parties Excluded from Federal Procurement or Non Procurement Program, and Copyright/Confidential Information.

COMPANY NAME:_____

AUTHORIZED AGENT'S NAME (PRINTED):_____

SIGNATURE OF COMPANY OFFICIAL:_____

RETURN THIS DOCUMENT IN FRONT OF ORIGIONAL SUBMISSION PACKAGE

Provision Required in Contract (Govt. Code 2270.002) *(Required)*

RELATIONSHIPS WITH FOREIGN ENTITIES

During the 85th Legislative Session (2017), the State of Texas enacted two additional requirements affecting all government contracts for goods and services.

All government contracts for goods and services signed after September 1, 2017 must include required provisions from HB 89 (Certification Regarding Israel), and language to implement SB 252 (Verification Regarding Terrorist Organizations).

Therefore, in compliance with HB 89 and SB 252 of the 85th Texas Legislative Session, Contractor agrees that:

> In accordance with Texas Government Code Chapter 2252, Subchapter F, Contractor certifies that it is not a company identified on the Texas Comptroller's list of companies known to have contracts with, or provide supplies or services to, the Government of Iran, the Government of Sudan, or a foreign organization designated as a Foreign Terrorist Organization by the U.S. Secretary of State.
>
> Contractor further certifies and verifies that, pursuant to Texas Government Code Chapter 2270, neither Contractor, nor any affiliate, subsidiary, or parent company of Contractor, if any (the "Contractor Companies"), boycotts Israel, and Contractor agrees that Contractor and Contractor Companies will not boycott Israel during the term of Agreement with Fort Bend ISD.

Name of Vendor ("Contractor")

Mailing Address | City | State | Zip

Prepared by | Title

RETURN THIS DOCUMENT IN FRONT OF ORIGIONAL SUBMISSION PACKAGE

Addenda Acknowledgement *(Required)*

I acknowledge the receipt of Addenda #___through #____, and my submittal reflects the contents of those addenda.

Name:_____

Signature:_____

Date:_____

BP030_Willowridge HS – Construction Phasing

- Start building addition (10 months, March 2026 – Dec 2026)
- Complete building addition (Jan 2027)
- Move existing FA program to new addition (4 weeks)
    - Drama
    - Choir
    - Orchestra
    - Mariachi
    - Band Hall
    - Music library
    - Uniform storage
- Move 2nd floor art program to adjacent classrooms across hall (2 weeks)

- Start existing FA space reno (including 2nd floor art spaces) (10 months, Feb 2027 – Nov 2027)
- Move Appropriate FA program back to main bldg renovated space (6 weeks)
    - Mariachi
    - Percussion
    - Band hall
    - Ensemble
- Move 2nd floor art program to newly renovated classrooms across hall (2 weeks)

SUMMER 1 (2.5 months, June 2026 – Mid-Aug 2026)

- Major Mechanical & Electrical
    - Field House mech and elec updates
    - Chiller 1, 2 replacement
    - Chiller 3 replacement (possible alt chiller #4 add)
- Renovate existing auditorium

SUMMER 2 (2.5 months, June 2027 – Mid-August 2027)

- Major Mechanical & Electrical
    - Area ‘F’ HVAC upgrades
    - Elevator upgrades

BP030 Willowridge High School Renovations

BP030_WRHS Phasing Schedule	2026												2027												2028	
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Construct New Addition			Phase 1																							
Existing to Operates As Is																										
Emergency Egress in Place																										
Move/Transition																										
Move Drama, Choir, Orchestra, Mariachi, Band Hall, Music Library, uniform storage to New Addition																										
Move 2nd floor art program to adjacent classrooms across hall																										
Main Building Demo														Demo												
Demo Choir, Dance, Drama & Orchestra																										
Demo 2nd floor art rooms																										
Renovate Existing Fine Arts														Phase 2												
Reno Orchestra, Choir, Drama, & Dance																										
Reno Existing Auditorium & Stage																										
Band & Art to remain in Existing																										
Move/Transition																										
Move Mariachi, Percussion, Band, Ensemble back into Existing																										
2nd art rooms move back to newly renovated rooms across hall																										
Summer 1: Major Mechanial & Electrical						Summer 1																				
Field House Mech and elec updates																										
Replace Main Bldg Chiller #1 and #2																										
Replace Chiller #3 (or keep CH-3 & add CH-4)																										
Summer 2: Additional Mechanial & Electrical																		Summer 2								
Area 'F' HVAC upgrades																										
Elevator(s)																										
Renovate existing auditorium																										

DOCUMENT 00 31 26 - EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. An existing asbestos report for Project, prepared by Terracon, dated September 17, 2025, is attached to this Document.

END OF DOCUMENT

Limited Path of Construction Asbestos Survey Report

Willowridge High School

16301 Chimney Rock Road

Houston, Texas

BP030 Fine Arts Addition and Renovations

September 17, 2025 | Project Number: 92257B43

Prepared for:

Fort Bend Independent School District
Design & Construction Department
2323 Texas Parkway
Missouri City, Texas

Asbestos Inspector
Christian Pedraza
TDSHS Licensed Asbestos Inspector
License Number 60-4222

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September 17, 2025

Ms. Nancy Lane
Senior Project Manager
Design & Construction Department
Fort Bend Independent School District
2323 Texas Parkway
Missouri City, Texas 77489

Office: 281-634-5591
Cell: 832-788-7328
E-mail: nancy.lane@fortbendisd.gov

RE: **Limited Path of Construction Asbestos Survey Report**
Willowridge High School
16301 Chimney Rock Road
Houston, Texas
Terracon Project No. 92257B43
BP030 Fine Arts Addition and Renovations

Dear Ms. Lane:

The purpose of this report is to present the results of a limited asbestos survey at the referenced project site. Terracon performed this survey on August 27-28, 2025, in general accordance with Terracon Proposal No. P92257614 dated August 18, 2025. We understand the purpose of this survey was to identify and locate asbestos-containing materials (ACM) present in the path of construction (POC) prior to planned renovation.

Asbestos was identified in the following materials: **floor tile mastic beneath non-asbestos tile in the closet in Rm. A201; sink undercoat on the bottom of the sink in the closet in Rm. A201.** Please refer to the attached report for details.

Terracon appreciates the opportunity to partner with you on this project. If you have any questions regarding this report, please contact the undersigned at 713-690-8989.

Sincerely,
Terracon Consultants, Inc.

Jaye Stanley
Senior Project Manager
TDSHS License No. 10-5644

Kevin Maloney
Senior Project Manager
TDSHS License No. 10-5547

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 Project Objective 1

1.2 Project Limitations 1

2.0 BUILDING DESCRIPTION 2

3.0 FIELD ACTIVITIES 2

3.1 Visual Assessment 2
3.2 Physical Assessment 3
3.3 Sample Collection 3
3.4 Sample Analysis 3

4.0 REGULATORY OVERVIEW 3

5.0 FINDINGS AND RECOMMENDATIONS 5

6.0 GENERAL COMMENTS 5

APPENDICES

Appendix A Asbestos Survey Sample Summary
Appendix B Asbestos Analytical Laboratory Report
Appendix C Licenses & Certifications

1.0 INTRODUCTION

Terracon conducted a limited path of construction (POC) asbestos survey at Willowridge High School, located at 16301 Chimney Rock Road in Houston, Texas. The survey was conducted on August 27-28, 2025, by a State of Texas licensed asbestos inspector in general accordance with Terracon Proposal No. P92257614 dated August 18, 2025.

Interior flooring materials in the building were inspected, and homogeneous areas of suspect asbestos-containing materials (ACM) were visually identified and documented. Although reasonable effort was made to inspect accessible suspect materials, additional suspect but un-sampled materials could be located beneath cabinets, in voids or in other concealed areas. Suspect ACM samples were collected in general accordance with the sampling protocols outlined in Environmental Protection Agency (EPA) regulation 40 CFR 763 (Asbestos Hazard Emergency Response Act, AHERA) and the Texas Asbestos Health Protection Rules (TAHPR). Samples were delivered to a State of Texas licensed laboratory for analysis by polarized light microscopy (PLM).

1.1 Project Objective

We understand the purpose of this survey was to identify and quantify asbestos-containing materials (ACM) present in the POC for fine arts and other areas prior to renovation. The Texas Asbestos Health Protection Rules (TAHPR), Senate Bill 509 and EPA regulation 40 CFR 61, Subpart M, National Emission Standards for Hazardous Air Pollutants (NESHAP), require that an asbestos survey be performed prior to issuance of a city construction permit and prohibit the release of asbestos fibers to the atmosphere during renovation or demolition activities. The asbestos NESHAP requires that potentially regulated ACM be identified, classified and quantified prior to planned disturbances or demolition activities. The Occupational Safety and Health Administration (OSHA) has promulgated a worker protection standard for the disturbance of materials containing asbestos during demolition and renovation projects.

1.2 Project Limitations

Roof building components were excluded in the survey. Destructive sampling was conducted as indicated in Terracon's proposal.

The following areas and/or materials were inaccessible during our inspection:

- No inaccessible rooms or materials discovered at the time of the inspection

Ceiling Systems - Terracon assessed multiple areas above the ceiling systems, where feasible, but did not observe additional suspect ACM, except where noted in this report. The potential exists for additional suspect ACM or quantities of ACM to be present above ceiling systems.

Floor Coverings - Terracon lifted floor coverings in several areas in the building, where feasible, but did not observe additional floor coverings or layers, except where noted in this report. However, as Terracon could not assess beneath all floor coverings in all areas, there may be isolated areas of additional suspect asbestos-containing material present beneath existing coverings.

2.0 BUILDING DESCRIPTION

Building Description and Information	
Building	Two-story building constructed in 1979
Total Area - POC	351,830 square feet
Building Use	High School
Roof	Not included in this scope
Exterior	Limited section of auditorium wall included in this scope
Interior Walls	Painted CMU, drywall
Interior Ceilings	Ceiling tile, drywall
Interior Floors	Vinyl floor tile, carpeting, concrete, and cove base
Additional Information	N/A

3.0 FIELD ACTIVITIES

Messrs. Mike Solomon, Christian Pedraza, and Jonathan Hernandez, Texas Department of State Health Services (TDSHS) licensed asbestos inspectors (License Nos. 60-2465, 60-4222, and 60-4267, respectively), conducted the asbestos survey in general accordance with the sample collection protocols established in EPA regulation 40 CFR 763, AHERA. Copies of their licenses are attached in Appendix C. The following sections present a summary of survey activities.

3.1 Visual Assessment

Our survey activities began with visual observation of the rooms included in the POC on the first and second floors of the building to identify homogeneous areas of suspect ACM. A homogeneous area (HA) consists of building materials that appear similar throughout in terms of color, texture and date of application; building materials identified as glass, wood,

fiberglass, metal or rubber were not considered suspect ACM. The assessment was conducted throughout visually accessible areas in the POC.

3.2 Physical Assessment

Terracon conducted a physical assessment of each HA of suspect ACM to assess the friability and condition of the materials. The EPA defines a friable material as a material that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. Terracon assessed friability by physically touching suspect ACM.

3.3 Sample Collection

Based on the results of the visual observation, Terracon collected random bulk samples from each HA of suspect ACM observed in general accordance with AHERA sampling protocols. Sample team members collected bulk samples using wet methods as applicable to reduce the potential for fiber release. Samples were placed in sealable containers and labeled with unique sample numbers using an indelible marker.

One hundred seventeen (117) bulk samples were collected from thirty-seven (37) homogeneous areas of suspect ACM. A summary of suspect ACM samples collected during the survey is included in the chain-of- custody (COC) in Appendix B.

3.4 Sample Analysis

Bulk samples were submitted under COC to Micro Analytical Services, Inc. (MAS) of Houston, Texas, for analysis by polarized light microscopy per EPA methodology EPA/600/R-93/116. The percentage of asbestos, where applicable, was determined by microscopic visual estimation. MAS is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP Accreditation No. 200618-0) and licensed by the TDSHS (TDSHS No. 30-0341).

4.0 REGULATORY OVERVIEW

Title 25, Part 1, Chapter 296, the TAHPR, regulates asbestos fiber emission and asbestos waste disposal practices for public buildings. The TAHPR also requires the identification and classification of existing asbestos-containing building materials prior to demolition or renovation activity. Under TAHPR, asbestos-containing building materials are classified as either friable or nonfriable ACM containing 1% or more asbestos. Friable materials are those that, when dry, may be crumbled, pulverized or reduced to powder by hand pressure.

TAHPR requires that any asbestos-related activity be performed by TDSHS licensed individuals. An asbestos-related activity consists of the disturbance (whether intentional or

unintentional), removal, encapsulation, or enclosure of asbestos, including preparations or final clearance activities, the performance of asbestos surveys, the development of management plans and response actions, asbestos project design, the collection or analysis of asbestos samples, monitoring for airborne asbestos, or any other activity required to be licensed under TAHPR.

TAHPR requires that abatement in public buildings be performed by a TDSHS licensed asbestos abatement contractor in accordance with a project design prepared by a TDSHS licensed asbestos consultant. In addition, a TDSHS licensed asbestos consultant agency must perform third-party air monitoring during the abatement activities.

TAHPR requires that written notification be submitted before beginning renovation projects that include the disturbance of any quantity of ACM in a public or commercial building or facility, and before the demolition of a building or facility, even when no asbestos is present. This written notification must be provided to the TDSHS at least 10 working days prior to the commencement of asbestos abatement or demolition activities.

40 CFR Part 61 Subpart M, the asbestos NESHAP, regulates asbestos fiber emission and asbestos waste disposal practices for commercial buildings and facilities. NESHAP requires the identification and classification of existing asbestos-containing building materials prior to demolition or renovation activity. Under NESHAP, building materials containing greater than one percent (>1%) asbestos are classified as either friable, Category I nonfriable or Category II nonfriable ACM. Friable materials are those that, when dry, may be crumbled, pulverized or reduced to powder by hand pressure. Category I nonfriable ACM includes packing, gaskets, resilient floor coverings and asphalt roofing products. Category II nonfriable ACM includes any nonfriable materials other than those classified as Category I materials.

Friable ACM, Category I and II nonfriable ACM in poor condition, that have become friable, or which will be subject to drilling, sanding, grinding, cutting, or abrading and which could be crushed or pulverized during anticipated renovation or demolition activities are considered regulated ACM (RACM). NESHAP requires that written notification be submitted before beginning renovation projects that include the disturbance of greater than 160 square feet, 260 linear feet, or 35 cubic feet of RACM in any building or facility, or before the demolition of any building or facility, even when no asbestos is present. This written notification must be provided to the TDSHS at least 10 working days prior to the commencement of asbestos abatement or demolition activities.

29 CFR 1926.1101, the OSHA Asbestos standard for the construction industry, regulates workplace exposure to asbestos. The OSHA standard classifies construction and maintenance activities that could disturb ACM and specifies work practices and precautions that employers must follow when engaging in each class of regulated work. The OSHA standard also requires that employee exposure to airborne asbestos fibers be maintained below the Permissible

Exposure Limit (PEL) of 0.1 asbestos fibers per cubic centimeter (f/cc) of air as an 8-hour Time Weighted Average (TWA).

5.0 FINDINGS AND RECOMMENDATIONS

Asbestos was identified in the following materials:

- Black mastic beneath non-asbestos floor tiles in the storage room adjacent to Rm. A201; and,
- Black sink undercoat on the bottom of the sink in the storage room adjacent to Rm. A201.

Appendix A contains a summary of the collected samples and the lab results. The laboratory analytical report is included as Appendix B.

If the floor tiles in the closet are in good condition, the mastic may be left in place and new flooring installed over the floor tiles. Alternatively, the mastic and tiles may be abated using the Resilient Floor Covering Institute (RFCI) method by asbestos workers trained in the RFCI method; OR, the mastic and tiles may be abated in full containment according to specifications provided by a licensed asbestos consultant. Because the building is a school, Terracon recommends removal by a licensed asbestos abatement contractor in full containment according to specifications provided by Terracon.

If the sink is to be removed or if the plumbing will be otherwise affected by renovation activities, then Terracon recommends that the sink be removed whole by a licensed asbestos abatement contractor according to specifications prepared by a licensed asbestos consultant company.

If suspect asbestos-containing materials are discovered during the renovation work that were not sampled as part of this limited POC survey, they should not be disturbed until the presence of asbestos is either confirmed or ruled out by laboratory analysis.

6.0 GENERAL COMMENTS

Terracon conducted this limited POC asbestos survey in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. The results, findings, conclusions, and recommendations expressed in this report are based on conditions observed during our limited POC survey of the building. The information contained in this report is relevant to the dates on which this survey was performed and should not be relied upon to represent conditions later. This report has been

prepared on behalf of and exclusively for use by Fort Bend ISD for specific application to their project as discussed. This report is not a bidding document. Contractors, consultants or others reviewing this report must draw their own conclusions regarding further investigation or remediation deemed necessary. Terracon does not warrant the work of regulatory agencies, laboratories or other third parties supplying information that may have been used in the preparation of this report. No warranty, express or implied, is made.

APPENDIX A – ASBESTOS SURVEY SAMPLE SUMMARY

Limited Path of Construction Asbestos Survey
BP:0030 Fine Arts Addition and Renovations
Willowridge High School
Houston, Texas
Terracon Project No. 92257B43

Sample ID	Material	Sample Location (Area)	Percent/Type Asbestos	Friability	Assessed Condition	Estimated Quantity
1-MA2-1,2,3	Architectural brick and mortar	Auditorium stage stairs	ND	NA	Good	2,000 sf
2-CP5- 4,5,6	Concrete	Auditorium stairs	ND	NA	Good	110 sf
3-MG7- 7,8,9	Yellow mastic	Beneath brown carpet in auditorium	ND	NA	Good	2,500 sf
4-FC3-10,11,12	Yellow mastic on black cove base	Both levels of auditorium and lobby	ND	NA	Good	450 lf
5-PL5-13,14,15	Concrete wall texture	Auditorium and hallway	ND	NA	Good	2,200 sf
6-FT2-16,17,18	Dark blue vinyl floor tile & yellow mastic	Auditorium lobby	ND	NA	Good	180 sf
7-FT2-19,20,21	Light blue vinyl floor tile & yellow mastic	Auditorium lobby	ND	NA	Good	150 sf
8-FT2-22,23,24	Light gray 12" x 12" vinyl floor tile & yellow/brown mastic	Auditorium lobby and hallway	ND	NA	Good	350 sf
9-FT2-25,26,27	Multi-color 12" x 12" vinyl floor tile & yellow mastic	Main hallway by auditorium, Rm 112-5, percussion room, uniform storage room	ND	NA	Good	2,000 sf
10-FT2-28,29,30	Black 12" x 12" vinyl floor tile & yellow/tan mastic	2nd Floor auditorium Control Rm	ND	NA	Good	250 sf
11-MG7-31,32,33	Yellow mastic beneath blue carpet	2nd Floor auditorium balcony	ND	NA	Good	1,700 sf
12-WB5-34,35,36	Unpainted wallboard system	Scene Rm	ND	NA		200 sf

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Willowridge High School
Houston, Texas
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Sample ID	Material	Sample Location (Area)	Percent/Type Asbestos	Friability	Assessed Condition	Estimated Quantity
13-CT3-37,38,39	White 2′ x 2′ ceiling tile	Throughout school	ND	NA	Good	20,000 sf
14-FC3-40,41,42	Black cove base & yellow mastic	Band Rm, Rooms B111, B113, B112, Rm 112-5	ND	NA	Good	500 lf
15-FC2-43,43,45	Gray 12″ x 12″ vinyl floor tile, yellow mastic, & float	Rooms B112 and, practice room B106 B113	ND	NA	Good	500 sf
16-FT2-46,47,48	Multi-color on off-white 12″ x 12″ vinyl floor tile & yellow mastic	Rm B111 and band room	ND	NA	Good	750 sf
17-MA2-49,50, 51, 52,53,54, 55	CMU blocks	Walls in Rm 112-5, choir room, percussion room, Rm B106	ND	NA	Good	TBD
18-FT2-56,57,58	Light brown streaked 12″ x 12″ vinyl floor tile & brown mastic	Main hallway near auditorium	ND	NA	Good	350 sf
19-WB4-59,60,61	Painted wallboard system with rough finish	Ceiling above auditorium balcony	ND	NA	Good	1,200 sf
20-WB5-62,63,64, 65,66	White texture on circular wood panels	Auditorium ceiling	ND	NA	Good	1,050 sf
21-PI4-67,68,69	Plastic-covered yellow foam TSI with canvas wrap & white mastic	6″ Pipe and flanges in 2nd floor main mechanical room (MMR) (Chillers 1 & 2)	ND	NA	Good	45 sf

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Sample ID	Material	Sample Location (Area)	Percent/Type Asbestos	Friability	Assessed Condition	Estimated Quantity
22-PI4-70,71,72	Pink foam TSI with canvas wrap and white mastic	6" Pipe and flanges in 2nd floor MMR (Chiller 1)	ND	NA	Good	10 sf
23-PI4-73,74,75	Plastic-covered yellow foam TSI with canvas wrap & white mastic	Elbows on 6" pipe in 2nd floor MMR (Chillers 1 & 2)	ND	NA	Good	8 Elbows, 50 sf
24-PI4-76,77,68	Plastic-covered yellow foam TSI with white mastic between seams	Straight run (vertical) 6" pipe for Chiller 2 in 2nd floor MMR	ND	NA	Good	25 lf
25-PI4-79,80,81	Plastic-covered yellow foam TSI with yellow mastic on cover	Straight run (vertical) 6" pipe for Chiller 1 in 2nd floor MMR	ND	NA	Good	45 lf
26-PI4-82,83,84	Plastic-covered yellow fiberglass TSI	Straight run (horizontal) 10" pipe for Chillers 1 & 2 in 2nd floor MMR	ND	NA	Good	15 lf
27-PI4-85,86,87	Plastic-covered foam TSI with tarry cork and gray seam mastic	Straight run (horizontal)10" pipe for Chillers 1 & 2 in 2nd floor MMR	ND	NA	Good	75 lf
28-PI4-88,89,90	Plastic-covered foam TSI with tarry cork and white seam mastic	6 " Pipe for Chiller 1 in 2nd floor MMR	ND	NA	Good	30 lf
29-MI4-91,92,93	White duct mastic above ceilings	Rooms in Area F: 205,206,209,210, 214,215,216,222,223,226,227	ND	NA	Good	125 lf
30-MI4-94,95,96	White duct mastic above ceilings	Rooms in Area F: F110,111,114,115,119, 120,121,124,125,128,129	ND	NA	Good	100 lf

APPENDIX A – ASBESTOS SURVEY SAMPLE SUMMARY

Limited Path of Construction Asbestos Survey
BP:0030 Fine Arts Addition and Renovations
Willowridge High School
Houston, Texas
Terracon Project No. 92257B43

Sample ID	Material	Sample Location (Area)	Percent/Type Asbestos	Friability	Assessed Condition	Estimated Quantity
31-FT2-97,98,99	Multi-color 12" x 12" floor tile & yellow mastic	Rms A210, A206	ND	NA	Good	TBD
32-FC3-100,101,102	Black cove base & tan mastic	Rms A210,A201,A206	ND	NA	Good	350 lf
33-FT2-103,104,105	Gray 12" x 12" vinyl floor tile & yellow mastic	Rm A201	ND	NA	Good	500 sf
34-FT2-106,107,108	**Yellow 12" x 12" vinyl floor tile & black mastic**	**Rm A201 storage room**	**Mastic: 5% Chrysotile; Tile: ND**	**Cat. I**	**Good**	**120 sf**
35-SC6-109,110,111	**Black sink undercoat**	**Rm A201 storage room**	**2% Chrysotile**	**Cat. II**	**Good**	**6 sf**
36-WB4-112,113,114	Painted wallboard system with smooth finish	Walls in Rm A206	ND	NA	Good	250 sf
37-MI4-115,116,117	Gray HVAC duct mastic	Fieldhouse mechanical room	ND	NA	Good	TBD

sf = square feet lf = linear feet ND = None Detected NA = Not Applicable

Friable ACM are materials containing 1% or more asbestos that, when dry, may be crumbled, pulverized, or reduced to powder by hand pressure.
Category I ACM includes nonfriable gaskets, packings, asphaltic roofing materials, and resilient flooring containing 1% asbestos or more.
Category II ACM includes all other nonfriable materials containing 1% asbestos or more.

APPENDIX A – ASBESTOS SURVEY SAMPLE SUMMARY

Limited Path of Construction Asbestos Survey
BP:0030 Fine Arts Addition and Renovations
Willowridge High School
Houston, Texas
Terracon Project No. 92257B43

APPENDIX B

ASBESTOS ANALYTICAL LABORATORY REPORT

Micro Analytical Services, Inc. 11301 Richmond Ave. Suite K100B♦Houston♦Texas 77082♦Phone (281) 497-4500♦Fax (281) 497-4517

Asbestos Bulk Sample Chain of Custody

Company: Terracon	Contact: Aaron Dominguez	Project Name: Willowridge POC Survey
Address: 11555 Clay Road, Suite 100		Project #: 92257343
City: Houston	Email:	
State/Zip: Tx 77043-1239	Aaron.Dominguez@Terracon.com	Number of Samples: 120
Phone: 713-690-8989		
Fax: 713-690-8787	Date Collected: 8/27-28/2025	MAS Project #: 20078

Turnaround time (circle): *Emergency 1-day 2-day 3-day 4-day (5-day) Positive Stop: Yes (No)

Field ID	Lab ID	Sample Description	Sample Location	Comments
See Attached				

Relinquished by: Jonathan Hdz Date: 8-29-2025 Time: 1:10

Received by: TONY DONG Date: 8/29/25 Time: 1:10

Relinquished by: _____ Date: _____ Time: _____

Received by: _____ Date: _____ Time: _____

*Emergency TAT requires prior lab notification. All samples analyzed outside normal business hours are charged at Emergency rate.

Terracon Project No.: 92257B43

Inspector: Christian H. Pedraza / Jonathan Hernandez

Date Collected 8/27/2025

Sample No: (HA, BS, Code, Sample No.)	Condition (ND, D, SD)	Sample Location/Material Description	Material Location/HA
1 - MA2 - 1	ND	Architectural brick and mortar Auditorium Stage Stairs	Stage in Auditorium
- - 2	ND		Back of Auditorium
- - 3	ND		
2 - CP5 - 4	ND	Concrete Stairs - Auditorium Stairs	Auditorium Stage Stairs
- - 5	ND		
- - 6	ND		
3 - MG7 - 7	ND	Yellow mastic under brown carpet	Throughout Auditorium
- - 8	ND		
- - 9	ND		
4 - FC3 - 10	ND	Black cove base with yellow mastic	Auditorium, 2nd floor Auditorium balcony and
- - 11	ND		
- - 12	ND		
5 - PL5 - 13	SD	Concrete wall texture	Auditorium and hallway
- - 14	SD		
- - 15	SD		
6 - FT2 - 16	ND	Dark blue 12"x12" vinyl floor tile with yellow mastic	Lobby
- - 17	ND		
- - 18	ND		
7 - FT2 - 19	ND	Light blue 12x12" vinyl floor tile with yellow mastic	Lobby
- - 20	ND		
- - 21	ND		
- -			
- -			

Terracon Project No.: 92257B43

Page 2 of __

Inspector: Christian H. Pedraza / Jonathan Hernandez

Date Collected 8/27/2025

Sample No: (HA, BS, Code, Sample No.)	Condition (ND, D, SD)	Sample Location/Material Description	Material Location/HA
8 - FT2 - 22	ND	Light gray 12"x12" vinyl floor tile with yellow/brown mastic	Lobby and hallway to auditorium
- - 23	ND		
- - 24	ND		
9 - FT2 - 25	ND	Multi-color 12"x12" vinyl floor tile with yellow mastic	Main Hallway near auditorium and Room 112-5 in band room
- - 26	ND		Precussion room, Uniform storage
- - 27	ND		
10 - FT2 - 28	ND	Black 12"x12" vinyl floor tile with yellow & tan mastic	2nd floor auditorium Control Room
- - 29	ND		
- - 30	ND		
11 - MG7 - 31	ND	Yellow mastic under blue carpet	2nd floor auditorium balcony
- - 32	ND		
- - 33	ND		
12 - WBS - 34	ND	Unfinished wallboard System	Scene Room
- - 35	ND		
- - 36	ND		
13 - CT3 - 37	ND	White 2'x2' ceiling tile	Throughout school
- - 38	ND		
- - 39	ND		
14 - FC3 - 40	ND	Black cove base with yellow mastic	Band room, B111, B113, B112, 112-5
- - 41	ND		
- - 42	ND		
15 - FC2 - 43	ND	Gray 12"x12" vinyl floor tile with yellow mastic and floor float	Rooms B112 and B113, practice r
- - 44	ND		B106
- - 45	ND		

Terracon Project No.: 92267B43

Page 3 of ___

Inspector: Christian H. Pedraza / Jonathan Hernandez

Date Collected 8/21/2025

Sample No: (HA, BS, Code, Sample No.)	Condition (ND, D, SD)	Sample Location/Material Description	Material Location/HA
16 - FT2 - 46	ND	Off-white multi-color 12"x12" vinyl floor tile with yellow mastic	Room B111 and band room
- - 47	ND		
- - 48	ND		
17 - MA2 - 49	ND	Concrete masonry unit blocks	Rooms B111 112-5, chair room, precussion room Room B106
- - 50	ND		
- - 51	ND		
- - 52	ND		
- - 53	ND		
- - 54	ND		
- - 55	ND		
18 - FT2 - 56	ND	Light brown with brown streaks 12x12" floor tile with brown mastic	Main hallway near auditorium
- - 57	ND		
- - 58	ND		
19 - WB4 - 59	ND	Painted gypsum wallboard system with rough finish (ceiling)	2nd floor auditorium balcony
- - 60	ND		
- - 61	ND		
20 - WB5 - 62	ND	white texture on circular wood panels	Auditorium
- - 63	ND		
- - 64	ND		
- - 65	ND		
- - 66	ND		
21 - PI4 - 67	ND	Plastic covered foam pipe insulation with canvas wrap and white mastic (flanges) (yellow foam) (6" pipe)	Mechanical Room (CH-1 and CH-2)
- - 68	ND		
- - 69	ND		

Terracon Project No.: 92257B43

Inspector: Christian H. Pedraza / Jonathan Hernandez

Page 4 of __

Date Collected 8/28/2025

Sample No: (HA, BS, Code, Sample No.)	Condition (ND, D, SD)	Sample Location/Material Description	Material Location/HA
22 - PIH - 70	ND	Pink foam pipe insulation with canvas wrap and white mastic (flanges) (6" Pipe)	CH-1 Mechanical Room
- - 71	ND		
- - 72	ND		
23 - PIH - 73	ND	Plastic covered yellow foam pipe insulation with canvas wrap and white mastic (elbows) (6" Pipe)	CH-1 and CH-2 Mechanical R
- - 74	ND		
- - 75	ND		
24 - PIH - 76	ND	Plastic covered yellow foam pipe insulation with white mastic in between seams (Straights) vertical (6" Pipe)	CH-2 Mechanical Room
- - 77	ND		
- - 78	ND		
25 - PIH - 79	ND	Plastic covered yellow foam pipe insulation with yellow mastic on cover (Straights) vertical (6" Pipe)	CH-1 - Mechanical Room
- - 80	ND		
- - 81	ND		
26 - PIH - 82	ND	Plastic covered pipe with yellow fiberglass insulation (Straights) Horizontal (10" Pipe)	Mechanical Room CH-1 and CH
- - 83	ND		
- - 84	ND		
27 - PIH - 85	ND	Plastic covered pipe with tar cork foam and yellow foam insulation with gray seam mastic (Straight Horizontal) (10" Pipe)	Mechanical Room CH-2 and CH-2
- - 86	ND		
- - 87	ND		
28 - PIH - 88	ND	Plastic covered pipe with tar cork foam insulation and white seam mastic (6" Pipe)	Mechanical Room CH-1
- - 89	ND		
- - 90	ND		
29 - MIH - 91	ND	White duct mastic	Rooms 205, 206, 209, 210 214-216, 222, 22 226, 227
- - 92	ND		
- - 93	ND		

Terracon Project No.: 92257843

Inspector: Christian H. Peterson / Jonathan Hernandez

Date Collected 8/28/2025

Sample No: (HA, BS, Code, Sample No.)	Condition (ND, D, SD)	Sample Location/Material Description	Material Location/HA
30 - MIY - 94	ND	White duct mastic	Rooms F110, 111, 114, 115, 118-121, 124-125, 128,
- - 95	ND		
- - 96	ND		
31 - FT2 - 97	ND	Multi-color 12"x12" floor tile with yellow mastic	Rooms A210, A206
- - 98	ND		
- - 99	ND		
32 - FC3 - 100	ND	Black cove base with tan mastic	Rooms A210, A201, A206
- - 101	ND		
- - 102	ND		
33 - FT2 - 103	ND	Gray 12"x12" vinyl floor tile with yellow mastic	Room A201
- - 104	ND		
- - 105	ND		
34 - FT2 - 106	ND	Yellow 12"x12" vinyl floor tile with black mastic	Room A201 closet
- - 107	ND		
- - 108	ND		
35 - SC6 - 109	ND	Black sink undercoat	Room A201 closet
- - 110	ND		
- - 111	ND		
36 - WB4 - 112	ND	Painted gypsum wallboard system with smooth finish (walls)	Room A206
- - 113	ND		
- - 114	ND		
37 - MIY - 115	ND	Gray HVAC duct mastic	Fieldhouse mechanical Room
- - 116			
117			

Terracon Project No.: 92257B43

Page 6 of __

Inspector: Christian H. Pedroza/Jonathan Hernandez

Date Collected 8-7-2025

Sample No: (HA, BS, Code, Sample No.)	Condition (ND, D, SD)	Sample Location/Material Description	Material Location/HA
38 - WPI - 118	ND	Black rubber vibration dampner	Fieldhouse Mechanical Room
- - 119	ND	↓	↓
- - 120	ND	↓	↓
- -			
- -			
- -		

Micro Analytical Services, Inc. 11301 Richmond Ave. Ste.K100B♦Houston♦Tx 77082♦Phone(281)497-4500♦Fax(281)497-4517

NVLAP Lab Code: 200618-0 TDSHS License No. 30-0341

PLM BULK ASBESTOS ANALYSIS REPORT

CLIENT: Terracon **MAS JOB NO.:** 20078-00

PROJECT: Willowridge POC Survey **REPORT DATE:** September 3, 2025

TERRACON PROJECT: 92257B43

IDENTIFICATION: Asbestos, Bulk Sample Analysis, Quantitation by Visual Area Estimation

TEST METHOD: Polarized Light Microscopy with Dispersion Staining
EPA - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
EPA - 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Material

STATEMENT OF LABORATORY ACCREDITATION

These samples were analyzed at Micro Analytical Services, Inc. in the Asbestos Laboratory at 11301 Richmond Ave. Suite K100B, Houston, Texas, 77082. The Laboratory holds accreditation from the National Institute of Standards and Technology under the National Voluntary Laboratory Accreditation Program (NVLAP). This laboratory is also licensed and authorized to perform as an Asbestos Laboratory in the State of Texas within the purview of Texas Civil Statutes, Article 4477-3a, as amended, so long as this license is not suspended or revoked and is renewed according to the rules adopted by the Texas Board of Health.

The samples were analyzed in general accordance with the procedures outlined in the EPA - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples, EPA - 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Material, under AHERA, for the analysis of asbestos in building materials by polarized light microscopy. The results of each bulk sample relate only to the material tested as submitted to the laboratory and the results shall not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.

Specific questions concerning bulk sample results shall be directed to the Asbestos Bulk Laboratory at Micro Analytical Services, Inc.

Analyst: Tony T. Dang

Approved Signatory: 

Micro Analytical Services, Inc. 11301 Richmond Ave. Ste. K100B♦Houston♦Texas 77082♦Phone(281) 497-4500♦Fax(281) 497-4517

Polarized Light Microscopy Analysis

Terracon
11555 Clay Road Suite 100
Houston, Texas 77043-1239

MAS Project #: 20078-00
Date Received: 08/29/2025
Date Analyzed: 09/03/2025

Project Name: Willowridge POC Survey

Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
1-MA2-01 MAS614322	1	Dark grey non-fibrous CMU	No		80% Aggregate 20% Other
1-MA2-01 MAS614322	2	White non-fibrous mortar	No		70% Aggregate 30% Other
1-MA2-02 MAS614323	1	Dark grey non-fibrous CMU	No		80% Aggregate 20% Other
1-MA2-02 MAS614323	2	White non-fibrous mortar	No		70% Aggregate 30% Other
1-MA2-03 MAS614324	1	Dark grey non-fibrous CMU	No		80% Aggregate 20% Other
1-MA2-03 MAS614324	2	White non-fibrous mortar	No		70% Aggregate 30% Other
2-CP5-04 MAS614325	1	Grey/white non-fibrous concrete	No		80% Aggregate 20% Other
2-CP5-05 MAS614326	1	Grey/white non-fibrous concrete	No		80% Aggregate 20% Other
2-CP5-06 MAS614327	1	Grey/white non-fibrous concrete	No		80% Aggregate 20% Other
3-MG7-07 MAS614328	1	Yellow non-fibrous mastic	No		100% Mastic
3-MG7-08 MAS614329	1	Yellow non-fibrous mastic	No		100% Mastic
3-MG7-09 MAS614330	1	Yellow non-fibrous mastic	No		100% Mastic
4-FC3-10 MAS614331	1	Brown non-fibrous cove base	No		100% Vinyl
4-FC3-10 MAS614331	2	Beige non-fibrous mastic	No		100% Mastic

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Analyzed by: Tony Dang

Approved NVLAP Signatory: Tony Dang

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Polarized Light Microscopy Analysis

Terracon
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Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
4-FC3-11 MAS614332	1	Brown non-fibrous cove base	No		100% Vinyl
4-FC3-11 MAS614332	2	Beige non-fibrous mastic	No		100% Mastic
4-FC3-12 MAS614333	1	Brown non-fibrous cove base	No		100% Vinyl
4-FC3-12 MAS614333	2	Beige non-fibrous mastic	No		100% Mastic
5-PL5-13 MAS614334	1	White non-fibrous joint compound with beige paint	No		100% Other
5-PL5-14 MAS614335	1	White non-fibrous joint compound with beige paint	No		100% Other
5-PL5-15 MAS614336	1	White non-fibrous joint compound with beige paint	No		100% Other
6-FT2-16 MAS614337	1	Blue non-fibrous floor tile	No		100% Other
6-FT2-16 MAS614337	2	Yellow non-fibrous mastic	No		100% Mastic
6-FT2-17 MAS614338	1	Blue non-fibrous floor tile	No		100% Other
6-FT2-17 MAS614338	2	Yellow non-fibrous mastic	No		100% Mastic
6-FT2-18 MAS614339	1	Blue non-fibrous floor tile	No		100% Other
6-FT2-18 MAS614339	2	Yellow non-fibrous mastic	No		100% Mastic
6-FT2-19 MAS614339	1	Blue non-fibrous floor tile	No		100% Other

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Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
6-FT2-19 MAS614339	2	Yellow non-fibrous mastic	No		100% Mastic
7-FT2-19 MAS614340	1	Light blue non-fibrous floor tile	No		100% Other
7-FT2-19 MAS614340	2	Yellow non-fibrous mastic	No		100% Mastic
7-FT2-20 MAS614341	1	Light blue non-fibrous floor tile	No		100% Other
7-FT2-20 MAS614341	2	Yellow non-fibrous mastic	No		100% Mastic
7-FT2-21 MAS614342	1	Light blue non-fibrous floor tile	No		100% Other
7-FT2-21 MAS614342	2	Yellow non-fibrous mastic	No		100% Mastic
8-FT2-22 MAS614343	1	Beige non-fibrous floor tile	No		100% Other
8-FT2-22 MAS614343	2	Yellow non-fibrous mastic	No		100% Mastic
8-FT2-23 MAS614344	1	Beige non-fibrous floor tile	No		100% Other
8-FT2-23 MAS614344	2	Yellow non-fibrous mastic	No		100% Mastic
8-FT2-24 MAS614345	1	Beige non-fibrous floor tile	No		100% Other
8-FT2-24 MAS614345	2	Yellow non-fibrous mastic	No		100% Mastic
9-FT2-25 MAS614346	1	White non-fibrous floor tile	No		100% Other

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Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
9-FT2-25 MAS614346	2	Yellow non-fibrous mastic	No		100% Mastic
9-FT2-26 MAS614347	1	White non-fibrous floor tile	No		100% Other
9-FT2-26 MAS614347	2	Yellow non-fibrous mastic	No		100% Mastic
9-FT2-27 MAS614348	1	White non-fibrous floor tile	No		100% Other
9-FT2-27 MAS614348	2	Yellow non-fibrous mastic	No		100% Mastic
10-FT2-28 MAS614349	1	Black non-fibrous floor tile with white streaks	No		100% Other
10-FT2-28 MAS614349	2	Yellow non-fibrous mastic	No		100% Mastic
10-FT2-29 MAS614350	1	Black non-fibrous floor tile with white streaks	No		100% Other
10-FT2-29 MAS614350	2	Yellow non-fibrous mastic	No		100% Mastic
10-FT2-30 MAS614351	1	Black non-fibrous floor tile with white streaks	No		100% Other
10-FT2-30 MAS614351	2	Yellow non-fibrous mastic	No		100% Mastic
11-MG7-31 MAS614352	1	Yellow non-fibrous mastic	No		100% Mastic
11-MG7-32 MAS614353	1	Yellow non-fibrous mastic	No		100% Mastic
11-MG7-33 MAS614354	1	Yellow non-fibrous mastic	No		100% Mastic

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12-WB5-34 MAS614355	1	White non-fibrous texture with beige paint	No		100% Other
12-WB5-34 MAS614355	2	White non-fibrous joint compound with beige paper	No		70% Cellulose 30% Other
12-WB5-34 MAS614355	3	White fibrous gypsum with brown paper	No		70% Cellulose 30% Gypsum
12-WB5-35 MAS614356	1	White non-fibrous texture with beige paint	No		100% Other
12-WB5-35 MAS614356	2	White non-fibrous joint compound with beige paper	No		70% Cellulose 30% Other
12-WB5-35 MAS614356	3	White fibrous gypsum with brown paper	No		60% Cellulose 40% Gypsum
12-WB5-36 MAS614357	1	White non-fibrous texture with beige paint	No		100% Other
12-WB5-36 MAS614357	2	White non-fibrous joint compound with beige paper	No		70% Cellulose 30% Other
12-WB5-36 MAS614357	3	White fibrous gypsum with brown paper	No		60% Cellulose 40% Gypsum
13-CT3-37 MAS614358	1	Beige fibrous ceiling tile with white paint	No		10% Mineral Wool 40% Cellulose 30% Perlite 20% Other
13-CT3-38 MAS614359	1	Beige fibrous ceiling tile with white paint	No		10% Mineral Wool 40% Cellulose 30% Perlite 20% Other

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Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
13-CT3-39 MAS614360	1	Beige fibrous ceiling tile with white paint	No		10% Mineral Wool 40% Cellulose 30% Perlite 20% Other
14-FC3-40 MAS614361	1	Black non-fibrous cove base	No		100% Vinyl
14-FC3-40 MAS614361	2	Beige non-fibrous mastic	No		100% Mastic
14-FC3-41 MAS614362	1	Black non-fibrous cove base	No		100% Vinyl
14-FC3-41 MAS614362	2	Beige non-fibrous mastic	No		100% Mastic
14-FC3-42 MAS614363	1	Black non-fibrous cove base	No		100% Vinyl
14-FC3-42 MAS614363	2	Beige non-fibrous mastic	No		100% Mastic
15-FC2-43 MAS614364	1	Grey non-fibrous floor tile	No		100% Other
15-FC2-43 MAS614364	2	Yellow non-fibrous mastic	No		100% Mastic
15-FC2-43 MAS614364	3	Grey fibrous floor substrate	No		3% Cellulose 97% Other
15-FC2-44 MAS614365	1	Grey non-fibrous floor tile	No		100% Other
15-FC2-44 MAS614365	2	Yellow non-fibrous mastic	No		100% Mastic
15-FC2-44 MAS614365	3	Grey fibrous floor substrate	No		3% Cellulose 97% Other

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Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
15-FC2-45 MAS614366	1	Grey non-fibrous floor tile	No		100% Other
15-FC2-45 MAS614366	2	Yellow non-fibrous mastic	No		100% Mastic
15-FC2-45 MAS614366	3	Grey fibrous floor substrate	No		3% Cellulose 97% Other
16-FT2-46 MAS614367	1	White non-fibrous floor tile	No		100% Other
16-FT2-46 MAS614367	2	Yellow non-fibrous mastic	No		100% Mastic
16-FT2-47 MAS614368	1	White non-fibrous floor tile	No		100% Other
16-FT2-47 MAS614368	2	Yellow non-fibrous mastic	No		100% Mastic
16-FT2-48 MAS614369	1	White non-fibrous floor tile	No		100% Other
16-FT2-48 MAS614369	2	Yellow non-fibrous mastic	No		100% Mastic
17-MA2-49 MAS614370	1	Dark grey non-fibrous CMU with white paint	No		80% Aggregate 20% Other
17-MA2-49 MAS614370	2	Grey non-fibrous mortar with white paint	No		70% Aggregate 30% Other
17-MA2-50 MAS614371	1	Dark grey non-fibrous CMU with white paint	No		80% Aggregate 20% Other
17-MA2-50 MAS614371	2	Grey non-fibrous mortar with white paint	No		70% Aggregate 30% Other
17-MA2-51 MAS614372	1	Dark grey non-fibrous CMU with white paint	No		80% Aggregate 20% Other

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17-MA2-51 MAS614372	2	Grey non-fibrous mortar with white paint	No		70% Aggregate 30% Other
17-MA2-52 MAS614373	1	Dark grey non-fibrous CMU with white paint	No		80% Aggregate 20% Other
17-MA2-52 MAS614373	2	Grey non-fibrous mortar with white paint	No		70% Aggregate 30% Other
17-MA2-53 MAS614374	1	Dark grey non-fibrous CMU with white paint	No		80% Aggregate 20% Other
17-MA2-53 MAS614374	2	Grey non-fibrous mortar with white paint	No		70% Aggregate 30% Other
17-MA2-54 MAS614375	1	Dark grey non-fibrous CMU with white paint	No		80% Aggregate 20% Other
17-MA2-54 MAS614375	2	Grey non-fibrous mortar with white paint	No		70% Aggregate 30% Other
17-MA2-55 MAS614376	1	Dark grey non-fibrous CMU with white paint	No		80% Aggregate 20% Other
17-MA2-55 MAS614376	2	Grey non-fibrous mortar with white paint	No		70% Aggregate 30% Other
18-FT2-56 MAS614377	1	White non-fibrous floor tile	No		100% Other
18-FT2-56 MAS614377	2	Clear yellow non-fibrous mastic	No		100% Mastic
18-FT2-56 MAS614377	3	Brown non-fibrous floor substrate	No		100% Other
18-FT2-57 MAS614378	1	White non-fibrous floor tile	No		100% Other
18-FT2-57 MAS614378	2	Clear yellow non-fibrous mastic	No		100% Mastic

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18-FT2-57 MAS614378	3	Brown non-fibrous floor substrate	No		100% Other
18-FT2-58 MAS614379	1	White non-fibrous floor tile	No		100% Other
18-FT2-58 MAS614379	2	Clear yellow non-fibrous mastic	No		100% Mastic
18-FT2-58 MAS614379	3	Brown non-fibrous floor substrate	No		100% Other
19-WB4-59 MAS614380	1	White non-fibrous texture with white paint	No		100% Other
19-WB4-59 MAS614380	2	White non-fibrous joint compound with beige paper	No		70% Cellulose 30% Other
19-WB4-59 MAS614380	3	White fibrous gypsum with brown paper	No		40% Cellulose 60% Gypsum
19-WB4-60 MAS614381	1	White non-fibrous ceiling cover	No		100% Other
19-WB4-60 MAS614381	2	White non-fibrous joint compound with beige paper	No		70% Cellulose 30% Other
19-WB4-60 MAS614381	3	White fibrous gypsum with brown paper	No		40% Cellulose 60% Gypsum
19-WB4-61 MAS614382	1	White non-fibrous ceiling cover	No		100% Other
19-WB4-61 MAS614382	2	White non-fibrous joint compound with beige paper	No		70% Cellulose 30% Other
19-WB4-61 MAS614382	3	White fibrous gypsum with brown paper	No		40% Cellulose 60% Gypsum
20-WB5-62 MAS614383	1	White non-fibrous texture with white paint	No		10% Mica 90% Other

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20-WB5-63 MAS614384	1	White non-fibrous texture with white paint	No		10% Mica 20% Foam 70% Other
20-WB5-64 MAS614385	1	White non-fibrous texture with white paint	No		10% Mica 20% Foam 70% Other
20-WB5-65 MAS614386	1	White non-fibrous texture with white paint	No		10% Mica 20% Foam 70% Other
20-WB5-66 MAS614387	1	White non-fibrous texture with white paint	No		10% Mica 20% Foam 70% Other
21-PI4-67 MAS614388	1	Beige non-fibrous mastic	No		5% Wollastonite 15% fibrous Glass 80% Mastic
21-PI4-67 MAS614388	2	Beige non-fibrous plastic	No		100% Plastic
21-PI4-67 MAS614388	3	Beige non-fibrous foam	No		100% Foam
21-PI4-68 MAS614389	1	Beige non-fibrous mastic	No		5% Wollastonite 15% fibrous Glass 80% Mastic
21-PI4-68 MAS614389	2	Beige non-fibrous plastic	No		100% Plastic
21-PI4-68 MAS614389	3	Beige non-fibrous foam	No		100% Foam

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Micro Analytical Services, Inc. 11301 Richmond Ave. Ste. K100B♦Houston♦Texas 77082♦Phone(281) 497-4500♦Fax(281) 497-4517

Polarized Light Microscopy Analysis

Terracon
11555 Clay Road Suite 100
Houston, Texas 77043-1239

MAS Project #: 20078-00
Date Received: 08/29/2025
Date Analyzed: 09/03/2025

Project Name: Willowridge POC Survey

Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
21-PI4-69 MAS614390	1	Beige non-fibrous mastic	No		5% Wollastonite 15% fibrous Glass 80% Mastic
21-PI4-69 MAS614390	2	Beige non-fibrous plastic	No		100% Plastic
21-PI4-69 MAS614390	3	Beige non-fibrous foam	No		100% Foam
22-PI4-70 MAS614391	1	White fibrous paper with foil backing	No		10% fibrous Glass 45% Cellulose 45% Foil
22-PI4-70 MAS614391	2	Tan non-fibrous foam	No		100% Foam
22-PI4-71 MAS614392	1	White fibrous paper with foil backing	No		10% fibrous Glass 45% Cellulose 45% Foil
22-PI4-71 MAS614392	2	Tan non-fibrous foam	No		100% Foam
22-PI4-72 MAS614393	1	White fibrous mastic	No		20% fibrous Glass 80% Mastic
22-PI4-72 MAS614393	2	White fibrous paper with foil backing	No		10% fibrous Glass 45% Cellulose 45% Foil
22-PI4-72 MAS614393	3	Tan non-fibrous foam	No		100% Foam
23-PI4-73 MAS614394	1	White non-fibrous plastic	No		100% Plastic
23-PI4-73 MAS614394	2	Beige non-fibrous foam	No		100% Foam

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Project Name: Willowridge POC Survey

Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
23-PI4-74 MAS614395	1	White non-fibrous plastic	No		100% Plastic
23-PI4-74 MAS614395	2	Beige non-fibrous foam	No		100% Foam
23-PI4-75 MAS614396	1	White non-fibrous plastic	No		100% Plastic
23-PI4-75 MAS614396	2	Beige non-fibrous foam	No		100% Foam
24-PI4-76 MAS614397	1	Beige fibrous mastic	No		5% Wollastonite 95% Mastic
24-PI4-76 MAS614397	2	Yellow non-fibrous foam	No		100% Foam
24-PI4-77 MAS614398	1	Beige non-fibrous pipe cover	No		100% Plastic
24-PI4-77 MAS614398	2	Beige fibrous mastic	No		5% Wollastonite 95% Mastic
24-PI4-77 MAS614398	3	Yellow non-fibrous foam	No		100% Foam
24-PI4-78 MAS614399	1	Beige non-fibrous pipe cover	No		100% Plastic
24-PI4-78 MAS614399	2	Beige fibrous mastic	No		5% Wollastonite 95% Mastic
24-PI4-78 MAS614399	3	Yellow non-fibrous foam	No		100% Foam
25-PI4-79 MAS614400	1	Beige non-fibrous pipe cover	No		100% Plastic
25-PI4-79 MAS614400	2	Yellow non-fibrous foam	No		100% Foam

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Project Name: Willowridge POC Survey

Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
25-PI4-80 MAS614401	1	Beige non-fibrous pipe cover	No		100% Plastic
25-PI4-80 MAS614401	2	Yellow non-fibrous foam	No		100% Foam
25-PI4-81 MAS614402	1	Beige non-fibrous pipe cover	No		100% Plastic
25-PI4-81 MAS614402	2	Yellow non-fibrous foam	No		100% Foam
26-PI4-82 MAS614403	1	Beige non-fibrous pipe cover	No		100% Plastic
26-PI4-82 MAS614403	2	Yellow fibrous glass insulation	No		100% fibrous Glass
26-PI4-83 MAS614404	1	Beige non-fibrous pipe cover	No		100% Plastic
26-PI4-83 MAS614404	2	Yellow fibrous glass insulation	No		100% fibrous Glass
26-PI4-84 MAS614405	1	Beige non-fibrous pipe cover	No		100% Plastic
26-PI4-84 MAS614405	2	Yellow fibrous glass insulation	No		100% fibrous Glass
27-PI4-85 MAS614406	1	Grey non-fibrous mastic	No		100% Mastic
27-PI4-85 MAS614406	2	Beige non-fibrous foam	No		100% Foam
27-PI4-86 MAS614407	1	Beige non-fibrous pipe cover	No		100% Plastic
27-PI4-86 MAS614407	2	Yellow/black non-fibrous foam	No		100% Foam

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Project Name: Willowridge POC Survey

Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
27-PI4-87 MAS614408	1	Beige non-fibrous pipe cover	No		100% Plastic
27-PI4-87 MAS614408	2	Yellow/black non-fibrous foam	No		100% Foam
28-PI4-88 MAS614409	1	Beige non-fibrous pipe cover	No		100% Plastic
28-PI4-88 MAS614409	2	Black non-fibrous foam	No		100% Foam
28-PI4-89 MAS614410	1	Beige non-fibrous pipe cover	No		100% Plastic
28-PI4-89 MAS614410	2	Black non-fibrous foam	No		100% Foam
28-PI4-90 MAS614411	1	Beige non-fibrous pipe cover	No		100% Plastic
28-PI4-90 MAS614411	2	Black non-fibrous foam	No		100% Foam
29-MI4-91 MAS614412	1	White non-fibrous mastic	No		100% Mastic
29-MI4-91 MAS614412	2	White/silver fibrous wrap	No		10% fibrous Glass 45% Plastic 45% Foil
29-MI4-91 MAS614412	3	Brown fibrous glass insulation	No		100% fibrous Glass
29-MI4-92 MAS614413	1	White non-fibrous mastic	No		100% Mastic
29-MI4-92 MAS614413	2	White/silver fibrous wrap	No		10% fibrous Glass 45% Plastic 45% Foil

Samples have been analyzed by the EPA - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples, EPA - 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Material. The test results herein relate only to the sample submitted and analyzed. This report may only be reproduced in full with the approval of the Bulk Asbestos Laboratory of Micro Analytical Services (MAS). The above percentages are visual estimates of area percent. MAS is not responsible for any errors resulting from improper or incorrect sampling or shipping procedures. These samples will be retained for a period of 30 days. Accreditation by NVLAP in no way constitutes or implies product certification, approval, or endorsement by NIST. Some materials, especially floor tiles, contain asbestos fibers too thin to be detected by this method. NVLAP Lab Code: 200618 TDSHS License: 30-0341

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Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
29-MI4-92 MAS614413	3	Brown fibrous glass insulation	No		100% fibrous Glass
29-MI4-93 MAS614414	1	White non-fibrous mastic	No		100% Mastic
29-MI4-93 MAS614414	2	White/silver fibrous wrap	No		10% fibrous Glass 45% Plastic 45% Foil
29-MI4-93 MAS614414	3	Yellow fibrous glass insulation	No		100% fibrous Glass
30-MI4-94 MAS614415	1	White non-fibrous mastic	No		100% Mastic
30-MI4-94 MAS614415	2	White/silver fibrous wrap	No		10% fibrous Glass 45% Plastic 45% Foil
30-MI4-94 MAS614415	3	Yellow fibrous glass insulation	No		100% fibrous Glass
30-MI4-95 MAS614416	1	White non-fibrous mastic	No		100% Mastic
30-MI4-95 MAS614416	2	White/silver fibrous wrap	No		10% fibrous Glass 45% Plastic 45% Foil
30-MI4-95 MAS614416	3	Yellow fibrous glass insulation	No		100% fibrous Glass
30-MI4-96 MAS614417	1	White non-fibrous mastic	No		100% Mastic
30-MI4-96 MAS614417	2	White/silver fibrous wrap	No		10% fibrous Glass 45% Plastic 45% Foil

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Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
30-MI4-96 MAS614417	3	Yellow fibrous glass insulation	No		100% fibrous Glass
31-FT2-97 MAS614418	1	White non-fibrous floor tile	No		100% Other
31-FT2-97 MAS614418	2	Yellow non-fibrous floor tile	No		100% Mastic
31-FT2-98 MAS614419	1	White non-fibrous floor tile	No		100% Other
31-FT2-98 MAS614419	2	Yellow non-fibrous floor tile	No		100% Mastic
31-FT2-99 MAS614420	1	White non-fibrous floor tile	No		100% Other
31-FT2-99 MAS614420	2	Yellow non-fibrous floor tile	No		100% Mastic
32-FT2-100 MAS614421	1	Black non-fibrous cove base	No		100% Vinyl
32-FT2-100 MAS614421	2	Beige non-fibrous mastic	No		100% Mastic
32-FT2-101 MAS614422	1	Black non-fibrous cove base	No		100% Vinyl
32-FT2-101 MAS614422	2	Beige non-fibrous mastic	No		100% Mastic
32-FT2-102 MAS614423	1	Black non-fibrous cove base	No		100% Vinyl
32-FT2-102 MAS614423	2	Beige non-fibrous mastic	No		100% Mastic
33-FT2-103 MAS614424	1	Blue non-fibrous floor tile	No		100% Other

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Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
33-FT2-103 MAS614424	2	Yellow/black fibrous mastic	No		2% Cellulose 98% Mastic
33-FT2-104 MAS614425	1	Blue non-fibrous floor tile	No		100% Other
33-FT2-104 MAS614425	2	Yellow/black fibrous mastic	No		2% Cellulose 98% Mastic
33-FT2-105 MAS614426	1	Blue non-fibrous floor tile	No		100% Other
33-FT2-105 MAS614426	2	Yellow/black fibrous mastic	No		2% Cellulose 98% Mastic
34-FT2-106 MAS614427	1	Beige non-fibrous floor tile	No		100% Other
34-FT2-106 MAS614427	2	Black fibrous mastic	Yes	5% Chrysotile	95% Mastic
34-FT2-107 MAS614428	1	Beige non-fibrous floor tile	No		100% Other
34-FT2-107 MAS614428	2	Black fibrous mastic	Yes	5% Chrysotile	95% Mastic
34-FT2-108 MAS614429	1	Beige non-fibrous floor tile	No		100% Other
34-FT2-108 MAS614429	2	Black fibrous mastic	Yes	5% Chrysotile	95% Mastic
35-SC6-109 MAS614430	1	Black fibrous sink undercoat	Yes	2% Chrysotile	98% Other
35-SC6-110 MAS614431	1	Black fibrous sink undercoat	Yes	2% Chrysotile	98% Other
35-SC6-111 MAS614432	1	Black fibrous sink undercoat	Yes	2% Chrysotile	98% Other

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Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
36-WB4-112 MAS614433	1	White non-fibrous texture with white paint	No		100% Other
36-WB4-112 MAS614433	2	White non-fibrous joint compound with beige paper	No		70% Cellulose 30% Other
36-WB4-112 MAS614433	3	White fibrous gypsum with brown paper	No		40% Cellulose 60% Gypsum
36-WB4-113 MAS614434	1	White non-fibrous texture with white paint	No		100% Other
36-WB4-113 MAS614434	2	White non-fibrous joint compound with beige paper	No		70% Cellulose 30% Other
36-WB4-113 MAS614434	3	White fibrous gypsum with brown paper	No		60% Cellulose 40% Gypsum
36-WB4-114 MAS614435	1	White non-fibrous texture with white paint	No		100% Other
36-WB4-114 MAS614435	2	White non-fibrous joint compound with beige paper	No		70% Cellulose 30% Other
36-WB4-114 MAS614435	3	White fibrous gypsum with brown paper	No		60% Cellulose 40% Gypsum
37-MI4-115 MAS614436	1	Dark grey non-fibrous mastic	No		100% Mastic
37-MI4-116 MAS614437	1	Dark grey non-fibrous mastic	No		100% Mastic
37-MI4-117 MAS614438	1	Dark grey non-fibrous mastic	No		100% Mastic
38-WP1-118 MAS614439	1	Black fibrous vibration dampener	No		20% Synthetic 80% Other
38-WP1-119 MAS614440	1	Black fibrous vibration dampener	No		20% Synthetic 80% Other

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Field ID/ Lab ID	Layer #	Sample Description	Asbestos Detected? (Yes/No)	Asbestos Constituents (%)	Non-Asbestos Constituents (%)
38-WP1-120 MAS614441	1	Black fibrous vibration dampener	No		20% Synthetic 80% Other

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APPENDIX C

LICENSES & CERTIFICATIONS

Texas Department of State Health Services

TERRACON CONSULTANTS INC

is certified to perform as an

Asbestos Consultant Agency

in the State of Texas and is hereby governed by the rights, privileges and responsibilities set forth in Texas Occupations Code, Chapter 1954 and Title 12, Texas Administrative Code, Chapter 295 relating to Texas Asbestos Health Protection, as long as this license is not suspended or revoked.

License Number: 100157

Expiration Date: 11/30/2026

Jennifer Shuford, MD, MPH,
Commissioner of Health

Control Number: 97714

(Void After Expiration Date)

VOID IF ALTERED NON-TRANSFERABLE

SEE BACK

Texas Department of State Health Services

Asbestos Individual Consultant

JAYE R STANLEY

License No. 105644

Control No. 98344

Expiration Date: 18-Feb-2026



TEXAS
Health and Human Services

Texas Department of State Health Services

Asbestos Inspector

CHRISTIAN HUMBERTO PEDRAZA

License Number: 604222

Control Number: 101022

Expiration Date: 28-Oct-2026



TEXAS
Health and Human Services

Texas Department of State Health Services

Asbestos Inspector

JONATHAN HERNANDEZ

License Number: 604267

Control Number: 101228

Expiration Date: 10-Jul-2027



Texas Department of State Health Services

MICRO ANALYTICAL SERVICES INC

is certified to perform as an

Asbestos Laboratory

PCM, PLM

in the State of Texas and is hereby governed by the rights, privileges and responsibilities set forth in Texas Occupations Code, Chapter 1954 and Title 12, Texas Administrative Code, Chapter 295 relating to Texas Asbestos Health Protection, as long as this license is not suspended or revoked.

License Number: 300341

Expiration Date: 01/25/2026

Jennifer Shuford, MD, MPH,
Commissioner of Health

Control Number: 96774

(Void After Expiration Date)

VOID IF ALTERED NON-TRANSFERABLE

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Texas Department of State Health Services

Asbestos Individual Consultant

KEVIN P MALONEY

License No. 105547

Control No. 98329

Expiration Date: 12-Feb-2026



DOCUMENT 00 31 32 - GEOTECHNICAL DATA

1.1 SUMMARY

A. This document includes information pertaining to geotechnical data.

1.2 INVESTIGATION

A. An investigation of subsurface soil conditions at the building site was authorized by the Owner, and was subsequently performed by Aviles Engineering Corporation, project no. G153-24, dated July 17, 2025.

1.3 REPORT

A. The Geotechnical Investigation Report is for information only, and is not a warranty of subsurface conditions.

B. The Report is made available for information only, and is not a Contract Document.

C. The information contained in the Report represents design criteria, recommendations, and guidelines that were utilized as the basis of design for the engineering of the earthwork operations, paving design, and foundation design indicated in the Contract Documents. No changes in this design criteria will be considered or permitted. Where options are indicated, the options were considered by the respective design team members and implemented in the construction documents.

1.4 RESPONSIBILITY

A. Bidders are expected to examine the site and subsurface investigation reports and then decide for themselves the character of the materials to be encountered.

B. The Architect and Owner assume no responsibility for variations in subsoil conditions, quality, or stability, or for the presence, level, and extent of underground water.

C. The Architect and Owner assume no responsibility for Bidder’s interpretation of data contained in the Report.

END OF DOCUMENT

AVILES
ENGINEERING CORP.

GEOTECHNICAL INVESTIGATION

FORT BEND INDEPENDENT SCHOOL DISTRICT
BP030 - FINE ARTS BUILDING ADDITION
WILLOWRIDGE HIGH SCHOOL
16301 CHIMNEY ROCK ROAD
HOUSTON, TEXAS

Prepared for:
Fort Bend Independent School District
Missouri City, Texas

by

Aviles Engineering Corporation
5790 Windfern
Houston, Texas 77041
713-895-7645

REPORT NO. G153-24 (Final)

July 2025

AVILES
ENGINEERING CORP.

July 17, 2025

Ms. Nancy Lane
Fort Bend Independent School District
2323 Texas Parkway
Missouri City, Texas 77489

Reference: **Geotechnical Investigation**
Fort Bend Independent School District
BP030 – Fine Arts Building Addition
Willowridge High School
16301 Chimney Rock Road
Houston, Texas
AEC Report No.: G153-24 (Final)

Dear Ms. Lane

Aviles Engineering Corporation (AEC) is pleased to present this report of the results of our geotechnical investigation for the above referenced project. The project terms and conditions were performed in accordance with the Master Agreement for Professional Services between Fort Bend Independent School District (FBISD) and AEC, dated August 21, 2023. The project scope of services is in accordance with AEC Proposal No. G2024-09-11R3, dated February 18, 2025.

AEC appreciates the opportunity to be of service to you. Please call us if you have any questions or comments concerning this report or when we can be of further assistance.

Respectfully submitted,
Aviles Engineering Corporation
(TBPELS Firm Registration No. F-42)

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TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 General 1
1.2 Purpose and Scope 1
2.0 SUBSURFACE EXPLORATION 2
2.1 Soil Borings 2
2.2 Drilling and Sampling Methods 2
3.0 LABORATORY TESTING PROGRAM 3
4.0 SITE CONDITIONS 3
4.1 Subsurface Conditions 3
4.2 Hazardous Materials 4
4.3 Subsurface Variations 4
5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS 5
5.1 Building Addition 5
5.1.1 Building Foundations 5
5.1.2 Building Floor Slabs 8
5.1.2.1 Option 1 - Structural Floor Slab 9
5.1.2.2 Option 2 - Subgrade Supported Floor Slab 10
5.1.2.3 Option 3 - Inject Ionic Soil Stabilizer 13
5.2 Fill Requirements 14
5.2.1 Lime Stabilized Clay Fill 14
5.2.2 Select Clay Fill 15
5.2.3 General Fill 16
6.0 CONSTRUCTION CONSIDERATIONS 17
6.1 Site Preparation and Grading 17
6.2 Construction Monitoring 17
7.0 LIMITATIONS 17

ATTACHMENTS

Plate 1	Vicinity Map
Plate 2	Boring Location Plan
Plates 3 and 4	Boring Logs
Plate 5	Key to Symbols
Plate 6	Classification of Soils for Engineering Purposes
Plate 7	Terms Used on Boring Logs
Plate 8	ASTM & TXDOT Designation for Soil Laboratory Tests

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GEOTECHNICAL INVESTIGATION

BP030 - FINE ARTS BUILDING ADDITION
WILLOWRIDGE HIGH SCHOOL
16301 CHIMNEY ROCK ROAD
HOUSTON, TEXAS

1.0 INTRODUCTION

1.1 General

The report submitted herein presents the results of Aviles Engineering Corporation's (AEC) geotechnical investigation for the Willowridge High School Fine Arts Building Addition project, located at 16301 Chimney Rock Road in Houston, Texas (Fort Bend County Key Map No.: 611B), as part of the Fort Bend Independent School District (FBISD) 2023 Bond Program (FBISD Project No. BP030). A vicinity map of the project location is presented on Plate 1 in the Attachments.

Based on 50 percent construction drawings (dated June 6, 2025) prepared by Kirksey Architecture, a two story building will be added to the southeast side of the existing high school building (adjacent to the auditorium). The addition will have a footprint area of approximately 10,300 square feet. As-built drawings (dated July 20, 1977, by Simmons Cavitt McKnight Weymouth) indicate the existing adjacent high school building is supported on drilled and underreamed footings that are founded approximately 8 feet below grade.

AEC notes the provided drawings indicate that existing asphalt pavement around the proposed building addition will be demolished and reconstructed with new concrete pavement. However, recommendations for this pavement reconstruction are not included in AEC's scope of services for this project.

1.2 Purpose and Scope

The purpose of this geotechnical investigation is to evaluate the subsurface soil and groundwater conditions at the project site and develop geotechnical engineering recommendations for the proposed improvements. The scope of this geotechnical investigation is summarized below:

1. Drilling and sampling two geotechnical borings each to 20 feet below existing grade.
2. Engineering analyses and recommendations for foundation types, bearing depth, allowable bearing capacity, floor slab, and subgrade preparation for the building addition.

3. Construction recommendations for the proposed improvements.

2.0 SUBSURFACE EXPLORATION

2.1 Soil Borings

Boring locations were staked in the field by AEC personnel using a handheld GPS unit. AEC drilled two borings each to a depth 20 feet below existing grade in the vicinity of the building addition. The total drilling footage is 40 feet. The boring locations were not surveyed after completion of drilling. The approximate boring locations are shown on the Boring Location Plan on Plate 2 in the Attachments. Using the handheld GPS locations, AEC approximated the coordinates of the borings (in State Plane Grid Coordinates, Texas Central Zone 4204, US Survey Feet). AEC then compared the approximate boring locations against the project topographic survey (performed by Teague Nall and Perkins, Inc., dated February 23, 2024) in order to estimate boring elevations. The approximate boring coordinates and estimated elevations are summarized in Table 1 below.

Table 1. Summary of Approximate Boring Coordinates and Elevations

Boring No.	Approximate Northing (Grid, ft)	Approximate Easting (Grid, ft)	Approximate Elevation (ft)
B-1	13777106.81	3086555.01	68.8
B-2	13777136.92	3086447.23	68.1

2.2 Drilling and Sampling Methods

Borings B-1 and B-2 were drilled using a truck-mounted drilling rig and were advanced using dry auger method. Undisturbed samples of cohesive soils were obtained from the borings by pushing 3-inch diameter thin-wall, seamless steel Shelby tube samplers in general accordance with ASTM D 1587. Strength of the cohesive soils was estimated in the field using a hand penetrometer. The undisturbed samples of cohesive soils were extruded mechanically from the tube samplers in the field and wrapped in aluminum foil; all soil samples were sealed in plastic bags to reduce moisture loss and disturbance. The samples were then placed in core boxes and transported to the AEC laboratory for testing and further study. Groundwater readings were obtained during drilling and completion of drilling. The boreholes were backfilled with bentonite chips upon completion of drilling. Existing asphalt pavement at Boring B-2 was patched with cold-placed asphalt.

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3.0 LABORATORY TESTING PROGRAM

Soil laboratory testing was performed by AEC personnel. Samples from the borings were examined and classified in the laboratory by a technician under the supervision of a geotechnical engineer. Laboratory tests were performed on selected soil samples to evaluate the engineering properties of the subsurface soils in accordance with applicable ASTM Standards. Atterberg limits, moisture contents, percent passing a No. 200 sieve, and dry unit weight tests were performed on selected samples to establish the index properties and confirm field classification of the subsurface soils. Strength properties of cohesive soils were determined by means of unconfined compression (UC) tests performed on undisturbed samples. The laboratory test results are presented on the representative boring logs (see Plates 3 and 4 in the Attachments). A key to the boring logs, classification of soils for engineering purposes, terms used on boring logs, and reference ASTM Standards for laboratory testing are presented on Plates 5 through 8 in the Attachments.

4.0 SITE CONDITIONS

A summary of existing pavement sections encountered in AEC's boring is presented in Table 2 below.

Table 2. Summary of Existing Pavement Thickness

Boring No.	Street	Pavement Section
B-2	Parking Lot	3.25" asphalt, 7" sand and gravel base

4.1 Subsurface Conditions

Details of the soils encountered during drilling are presented in the boring logs on Plates 3 and 4 in the Attachments. Soil strata encountered in the borings are summarized below.

Boring	Depth (ft)	Description of Stratum
B-1	0 - 8	Firm to hard, Fat Clay (CH), with slickensides
	8 - 20	Very stiff, Fat Clay with Sand (CH)
B-2	0 – 0.27	Pavement and Base: Refer Table 2 in Section 4.0 of this report
	0.27 – 0.85	Base: 7" sand and gravel base
	0.85 - 20	Stiff to hard, Fat Clay (CH), with slickensides

Soil Types and Expansive Potential: The subsurface clayey soils encountered in the borings have high to very high plasticity (see "Degree of Plasticity of Cohesive Soils" on Plate 6 in the Attachments), with liquid limits (LL) ranging from 54 to 73, and plasticity indices (PI) ranging from 36 to 53. The cohesive soils encountered are classified as "CH" type soils in accordance with ASTM D 2487. "CH" soils undergo significant volume changes due to seasonal changes in soil moisture contents. Slickensides were encountered in some fat clay (CH) soils.

Groundwater: Groundwater was not encountered during drilling or after completion of drilling in the borings. The information in this report summarizes conditions found on the date the borings were drilled. However, it should be noted that our groundwater observations are short term (i.e., limited to the day the borings were drilled); groundwater depths and subsurface soil moisture contents will vary with environmental variations such as frequency and magnitude of rainfall and the time of year when construction is in progress.

4.2 Hazardous Materials

No signs of visual staining or odors were encountered during field drilling or during processing of the soil samples in the laboratory. However, AEC notes that the presence of potential hazardous material at other locations within the project area cannot be discounted based upon the very small and limited number of samples taken.

4.3 Subsurface Variations

It should be emphasized that: (i) at any given time, groundwater depths can vary from location to location, and (ii) at any given location, groundwater depths can change with time. Groundwater depths will vary with seasonal rainfall and other climatic/environmental events. It should be noted that the division of soil strata presented herein is based on available data and interpretation at the time of investigation. Subsurface conditions may vary away from and in between the boring locations.

Clay soils in the Greater Houston area typically have secondary features such as slickensides, calcareous and ferrous nodules, and contain sand/silt seams/lenses/layers/pockets. It should be noted that the information in the boring logs is based on 3-inch diameter soil samples. Soil samples were obtained continuously at intervals of 2 feet from the ground surface to a depth of 10 feet below grade, then at 5 feet intervals thereafter to the boring termination depth of 20 feet. A detailed description of the soil secondary features may not have been

obtained due to the small sample size and sampling interval between the samples. Therefore, while a boring log shows some soil secondary features, it should not be assumed that the features are absent where not indicated on the boring logs.

5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

Based on 50 percent construction drawings (dated June 6, 2025) prepared by Kirksey Architecture, a two story building will be added to the southeast side of the existing high school building (adjacent to the auditorium). The addition will have a footprint area of approximately 10,300 square feet. As-built drawings (dated July 20, 1977, by Simmons Cavitt McKnight Weymouth) indicate the existing adjacent high school building is supported on drilled and underreamed footings that are founded approximately 8 feet below grade.

Construction Specifications: AEC is not aware if there are specific construction specifications for FBISD projects. For this report, AEC has instead referred to City of Houston Standard Construction Specifications (COHSCS). AEC should be notified if different construction specifications should be used instead.

5.1 Building Addition

Based on the provided drawings, the proposed finished floor elevation (FFE) of the building addition is 69.86 feet Mean Sea Level (MSL). The topographic survey indicates that existing grade within the building addition footprint varies from an elevation of approximately 68.0 to 69.8 feet MSL. This indicates that as much as approximately 1.9 feet of fill material will be needed to raise existing grade to proposed FFE.

Soil and Groundwater Conditions: Based on Borings B-1 and B-2, the soil conditions at the building addition generally consist of firm to hard fat clay (CH) from the ground surface to the boring termination depths of 20 feet. Groundwater was not encountered during drilling or after completion of drilling.

5.1.1 Building Foundations

Based on Borings B-1 and B-2, AEC notes that the top 10 feet of soil at the building addition generally consist of clayey soils with a PI ranging from 37 to 53, which indicates a high to very high expansive potential (see Degree of Plasticity of Cohesive Soils on Plate 6 in the Attachments).

AEC notes that highly expansive clays within the zone of seasonal moisture variation will experience significant amounts of shrink and swell movements as their moisture contents vary throughout the years. In order to mitigate the impact of the expansive clays, AEC recommends that the building foundations be placed below the zone of seasonal moisture variation (which is typically 10 feet below grade in the Greater Houston area). AEC therefore recommends the building addition should be supported on drilled and underreamed footings that are founded at a depth of at least 10 feet below existing grade. As noted in Section 5.0 of this report, AEC understands that the existing high school building is supported on drilled-and-underreamed foundations bearing at a depth of 8 feet below existing grade; to avoid differential settlement between the existing building and the building addition foundations, **AEC recommends that the structural design of the building addition foundations and superstructure be kept structurally separate (through the use of expansion joints, for example)**.

Allowable Bearing Capacity and Footing Depth: Drilled and underreamed footings founded at a depth of approximately 10 feet below existing grade (i.e. bearing at an elevation of approximately 58.5 feet MSL) should be designed for an allowable bearing capacity of 2,700 pounds per square foot (psf) for sustained loads and an allowable bearing capacity of 4,000 psf for total loads. The allowable bearing capacities provided include a factor of safety (FS) of 3 for sustained loads and a FS of 2 for total loads. Whichever net allowable bearing capacity results in a larger footing diameter should be used for design.

Vertical Reinforcement: To withstand uplift forces resulting from the shrink/swell movements of clay soils in the moisture active zone, each footing should contain reinforcing steel throughout its full length to sustain an uplift load of at least 40d kips, where "d" is the diameter of the shaft in feet.

Footing Spacing: To reduce stress overlap from adjacent footings and potential construction problems, the minimum edge-to-edge clear spacing between the underreams should not be less than 0.6 x diameter of the larger underream. New foundations for the building addition should be spaced to reduce the potential of new foundations affecting existing building foundations (and vice versa) by placing the new foundations outside the bearing (stress) zone of existing foundations. The bearing (stress) zone can be defined by a line drawn downward from the outer edge of the existing foundation and inclined at an angle of 45 degrees to the vertical.

Footing Settlements: A detailed settlement analysis is beyond the scope of this investigation. Based on the soil conditions encountered and the anticipated structural loads, we estimate that drilled-and-underreamed footings, designed and constructed as recommended in this report, will experience total settlements on the

order of 1 inch. As noted above, AEC recommends that the building addition foundations and superstructure be kept structurally separate from the existing building in order to reduce the impact of differential settlement between the buildings.

Drilled-and-Underreamed Footing Construction: Drilled-and-underreamed footings should be constructed in accordance with Section 02465 of the 2023 COHSCS. A qualified geotechnical technician should check each footing excavation prior to placing concrete to insure that:

1) The footing has been constructed to the specified dimensions at the recommended depth and founded in the correct formation as indicated in this report;
2) The column is concentric with the pier cap/grade beam and drilled footing; and
3) Excessive cuttings, any soft or compressible materials, and ponded water are removed from the bottom of the excavation.

There is a possibility that slickensides and/or pockets/seams of sands/silts within the clay soils may make underreaming (belling) difficult and result in potential sloughing or caving-in of the shaft excavation sidewalls during construction, particularly for underreams over 6 feet in diameter. We recommend that a maximum diameter ratio of bell to shaft not exceed 2 to 1.

Based on Borings B-1 and B-2, AEC anticipates that the drilled and underreamed footings will be excavated within firm to hard fat clay (CH) soils. Groundwater was not encountered in the boreholes. However, it should be noted that our groundwater observations are short-term; groundwater depths and subsurface soils moisture contents will vary with environmental variations such as magnitude of rainfall and the time of year when construction is in progress. If groundwater is encountered within the cohesive soils during construction, sump pumps may be used to pump water out from the excavations and soft sediments should be removed. However, if significant sloughing or caving occurs during shaft excavation, further excavation should be stopped and a reduced bell/shaft ratio or even straight-sided shafts (matching the bell diameter) in combination with bentonite slurry and/or temporary casing may be necessary.

Placement of concrete should be accomplished immediately after excavation is completed to reduce potential for sloughing of the foundation soils. Footing excavations should not be left open overnight. No concrete should be placed without the prior approval of FBISD's Representative. New drilled footings should not be excavated within 2 bell diameters or 15 feet (edge to edge), whichever is larger, of an open footing excavation, or one in which concrete has been placed in the preceding 24 hours, to prevent movement of fresh concrete

from the recently filled footing to an adjacent unfilled footing.

5.1.2 Building Floor Slabs

As noted in Section 5.1 of this report, the proposed building addition FFE is 69.86 feet Mean Sea Level (MSL). The topographic survey indicates that existing grade within the building addition footprint varies from an elevation of approximately 68.0 to 69.8 feet MSL. This indicates that as much as approximately 1.9 feet of fill material will be needed to raise existing grade to proposed FFE.

Estimated Soil Movements: Potential Vertical Rise (PVR) is an estimate of the potential of an expansive soil to swell from its current state. PVR was computed using TxDOT test method Tex-124-E. Based on Borings B-1 and B-2, the existing soil at the proposed building addition location is highly expansive. Expansive clays exhibit a potential to shrink and swell with changes in their moisture contents. The changes in the soil moisture content are usually caused by variations in the seasonal amount of rainfall and evaporation rates or other localized factors like the moisture withdrawal by nearby trees. The seasonal moisture active zone generally extends to about 10 feet below ground in the Greater Houston area, and will be deeper if trees with deep root zones exist adjacent to the structures.

Additional movements can occur in areas if water is allowed to pond during or after construction on soils with high plasticity, or if highly plastic soils are allowed to dry out prior to fill or concrete placement. High plasticity clay may also experience shrinkage during periods of dry weather as moisture evaporation occurs at the ground surface and the groundwater table drops. The actual PVR of the site will be highly dependent upon the actual PI and moisture regime of the clayey soils at the time of construction. Therefore, uniformity and preservation of the moisture contents of the near surface clays during construction and during the life of the structure is critical to reducing potential shrink-swell movement of the floor slab.

PVR: For the top 10 feet of the existing soils encountered in Borings B-1 and B-2, the PVR at the proposed building addition is approximately 2.2 to 3.7 inches based on in-situ moisture conditions.

Table 3. Estimated PVR vs. Thickness of Replacement Fill for Building Addition

Thickness of Replacement Fill Beneath the Existing Ground Surface (ft)	PVR (in), based on Boring B-1	PVR (in), based on Boring B-2
0 (EL ~ 68.5')	3.7	2.2
1 (EL ~ 67.5')	3.2	2.0
2 (EL ~ 66.5')	2.7	1.8
3 (EL ~ 65.5')	2.1	1.5
4 (EL ~ 64.5')	1.6	1.2
5 (EL ~ 63.5')	1.2	1.0
6 (EL ~ 62.5')	1.0	0.7

Floor Slab: AEC understands that the PVR requirement for buildings is typically considered to be 1 inch. In accordance with Table 3, a minimum of 5 to 6 feet of soil excavation would be required to reduce the PVR of the building addition to 1 inch.

For the building addition, AEC recommends the following floor slab options be considered: (i) Option 1 - a structural floor slab supported on drilled and underreamed footings with a 8 inch void space between the bottom of the slab and the top of the subgrade soils; (ii) Option 2 - a subgrade supported floor slab, with 4 feet excavation and replacement of existing soils beneath the slab; or (iii) Option 3 - a subgrade supported floor slab, with treatment of the underlying soils by injecting an ionic soil stabilizer (ISS) to a depth of 10 feet.

5.1.2.1 Option 1 - Structural Floor Slab

The most effective method to mitigate movement of subgrade soils due to shrink-swell cycles of expansive soils is construction of a drilled-footing supported structural floor slab with 8 inch carton forms between the bottom of the slab and the top of the subgrade soil.

Subgrade Preparation: Subgrade preparation should extend a minimum of 5 feet beyond the floor slab perimeter. Existing base, pavement, or other structures should first be demolished and removed. After demolition, a minimum of 6 inches of surface soils, existing vegetation, trees, roots, and other deleterious

materials shall be removed and wasted. The excavation depth should be increased when inspection indicates the presence of organic or deleterious materials to greater depths.

The exposed subgrade should then be proof-rolled in accordance with Item 216 of the 2024 TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges to identify and remove any weak, compressible, or other unsuitable materials; such materials should be replaced with clean onsite clay soils. Afterwards, general clay fill can be placed and compacted to achieve the elevation at the bottom of the carton forms. General clay fill recommendations are presented in Section 5.2.3 of this report.

Grade Beams: We recommend that foundation grade beams be founded at least 24 inches below FFE. The grade beams should be constructed on 8 inch carton forms. Care should be taken so that the carton forms do not collapse during concrete placement and will not be exposed to water in the grade beam excavations. Surface water should not be allowed to seep into and remain in the carton form space during the life of the structures. AEC recommends that Motz blocks (or equivalent system) be used to prevent soil from filling the void beneath the grade beam after the carton forms have decayed. The drilled-and-underreamed footings and beams should be tied together.

Moisture Barrier: To prevent mildew or mold growth on the underside of the structural floor slab, we recommend that a horizontal moisture barrier (minimum 10-mil thick) be placed below the concrete slab (on top of the carton forms).

5.1.2.2 Option 2 - Subgrade Supported Floor Slab

In accordance with Table 3 in Section 5.1.2 of this report, approximately 5 to 6 feet of existing soil would have to be removed and replaced with low-expansive select fill in order to achieve a PVR of 1 inch, which is most likely cost-prohibitive and impractical. In addition, thick layers of compact fill will also experience vertical and differential settlement of the fill over time. Instead of excavating 5 to 6 feet of existing soil, **a concrete slab-on-grade in conjunction with *limited* (i.e. 4 feet) fill replacement can be considered as an alternative to full-depth replacement, if FBISD is willing to take some risk of floor slab movement**. This option assumes that uniformity and preservation of the moisture contents of the near surface clays during construction and during the life of the structure are maintained adequately, and that any resultant movements can be adequately sustained by the subgrade soils and foundation system.

It is AEC's experience that the majority of imported "select" fill that is being excavated from borrow pits in the Greater Houston area is poor quality that does not meet AEC's select fill specifications (see Section 5.2.2 of this report). Imported "select fill" material typically has a high sand/silt content combined with large clay boulders/chunks and is not homogenous. This material is permeable, which will allow surface water to infiltrate through it and cause both the clay boulders within the fill to swell and will also penetrate through the sand/silt and then cause the underlying natural clay soils to swell as well, resulting in significant floor slab movement and cracking.

Based on the expansive soils encountered in Borings B-1 and B-2 at the building addition location, **AEC prefers the use of lime-stabilized clay fill for this project over using imported "select" fill for the soil replacement beneath a subgrade supported floor slab for this site. If FBISD decides to use select clay fill instead of lime-stabilized clay fill, AEC cautions that stringent quality control (QC) over select clay fill material imported to the site should be observed**, both by FBISD's inspectors and the onsite Construction Materials Testing (CMT) laboratory. Without proper QC, there is a risk that substandard select fill will either have a higher than allowed expansive potential or a higher than allowed sand content, both of which will result in potential long-term issues for the floor slab performance.

Using lime stabilized clay soil will be beneficial for the overall performance of the building floor slab because: (i) it will reduce the potential for surface water to enter into the highly expansive natural clay soils beneath the building pad which in turn will reduce the potential for the subgrade clays to shrink and swell; (ii) it will be subject to less vertical and differential settlement as the fill consolidates over time; and (iii) it will provide a competent working surface during construction of the building pad. Lime-stabilized clay recommendations are presented in Section 5.2.1 of this report.

Subgrade Preparation: Subgrade preparation should extend a minimum of 5 feet beyond the floor slab perimeter. Existing base, pavement, or other structures should first be demolished and removed. After demolition, a minimum of 6 inches of surface soils, existing vegetation, trees, roots, and other deleterious materials shall be removed and wasted. The excavation depth should be increased when inspection indicates the presence of organics or deleterious materials to greater depths.

After surface stripping, an additional 3.5 feet [which is a total depth of 4 feet (i.e. at an elevation of approximately 64.5 feet MSL) when considering the 6 inches of surface stripping] of existing soils should be removed. After the overburden is excavated, the exposed subgrade should be proof-rolled in accordance with

Item 216 of the 2024 TxDOT Standard Specifications to identify and remove any weak, compressible, or other unsuitable materials; such materials should be replaced with compacted lime-stabilized soils as necessary. After proof rolling is performed, either compacted lime-stabilized clay fill or compacted select clay fill should then be used to achieve the bottom of the building floor slab (which has an FFE of 69.86 feet MSL). Lime-stabilized clay fill and select clay fill recommendations are presented in Sections 5.2.1 and 5.2.2 of this report, respectively.

According to Table 3 in Section 5.1.2 of this report, **the PVR for 4 feet of soil replacement will still be 1.2 to 1.6 inches. FBISD should be aware that some risk of floor slab movement is still present if this floor slab option is selected**. If conditions which exacerbate moisture variations such as the presence of trees, poor drainage, excessive drying/wetting of subsurface soils, or leaking underground utilities are located nearby, the floor slab total vertical movements and net differential vertical movements could be higher than estimated. If a lower PVR risk is desired, AEC recommends that either a structural slab (Option 1, see Section 5.1.2.1 of this report) or ISS stabilization (Option 3, see Section 5.1.2.3 of this report) be considered instead.

Grade Beams: We recommend that foundation grade beams be founded at least 30 inches below FFE. The grade beams can be constructed on 8 inch carton forms. If carton forms are used (at the discretion of the building designer), care should be taken so that the carton forms do not collapse during concrete placement and will not be exposed to water in the grade beam excavations. Surface water should not be allowed to seep into and remain in the carton form space during the life of the structures. If carton forms are used, AEC recommends that Motz blocks (or equivalent system) be used to prevent soil from filling the void beneath the grade beam after the carton forms have decayed. If no carton forms will be used, we recommend that tensile reinforcement be placed in both top and bottom of the beams. The drilled footings and beams should be tied together.

Floor slabs are typically structurally tied to the grade beams. Alternatively, isolating the floor slabs from grade beams with a flexible impervious compound will be beneficial to reduce the potential for slab cracking due to differential soil movement; however, its use will not mitigate the total and differential PVR movements and the floor slabs are expected to move corresponding to the subgrade soils.

Moisture Barrier: We recommend that a horizontal moisture barrier (minimum 10-mil thick) be placed below the concrete slab to move edge effects away from the slab and mitigate seasonal fluctuations of water content directly below the structure.

5.1.2.3 Option 3 - Inject Ionic Soil Stabilizer

Option 3 also includes a subgrade supported floor slab; however, in order to limit the PVR impact on the floor slab, the existing expansive clay soils within the building footprint can be injected with an ISS to a minimum depth of 10 feet (without requiring over-excavation of existing soil, as presented in Option 2 in Section 5.1.2.2 of this report). Injection of a liquid ISS, such as Earthlok Soil Stabilizer (or equivalent product), should be able to reduce the potential of the expansive clay soils from experiencing shrink and swell movements and therefore prevent the building floor slab from experiencing distress in the future due to movement of expansive soils.

However, although research has been conducted to determine the effectiveness of ionic clay soil stabilization, this treatment method has not yet achieved widespread acceptance and no national standard (by the federal government or professional civil engineering body) is currently available. **The effectiveness of injecting liquid ISS in an effort to reduce the expansive potential of clay soils cannot be guaranteed by AEC**, especially in regard to: (i) the ability of the ISS to render the clay effectively inert; and (ii) for the ISS to adequately penetrate/permeate vertically and horizontally throughout the clay mass. **If the ISS injection treatment method is used, AEC will accept no liability regarding its effectiveness to reduce/prevent shrink and swell movements of expansive clay soils, or on the long-term performance of the building floor slabs (and any floor slab distress that could potentially occur)**.

AEC notes that an injection depth of 10 feet should be able to cover existing expansive clay soils within the moisture active zone; if treatment is effective, then the anticipated PVR of the floor slab should be on the order of 1 inch, or less. AEC suggests that the grid spacing of the injection points be close enough to ensure that the expansive clay soils within the treatment area be adequately treated; some degree of overlap between treated soil columns is recommended. However, the ultimate determination of treatment area, injection spacing, treatment depth, as well as means and methods for liquid ISS injection shall be by the ISS Contractor.

Subgrade Preparation: Subgrade preparation should extend a minimum of 5 feet beyond the floor slab perimeter. Existing base, pavement, or other structures should first be demolished and removed. After demolition, a minimum of 6 inches of surface soils, existing vegetation, trees, roots, and other deleterious materials shall be removed and wasted. The exposed subgrade should then be proof-rolled, in accordance with Item 216 of the 2024 TxDOT Standard Specifications for Construction and Maintenance of Highways,

Streets, and Bridges to identify and remove any weak, compressible, or other unsuitable materials; such materials should be replaced with compacted general fill. After proof-rolling, the ISS can be injected to a minimum depth of 10 feet below grade; the center to center spacing of the ISS injections should be determined by the ISS provider.

Testing: AEC understands that Earthlok requires that geotechnical soil testing be performed after soil stabilization is completed for warranty purposes. AEC recommends that soil borings be performed to a depth of 10 feet within the ISS treated areas. Recommended laboratory tests include, but are not necessarily limited to moisture contents, Atterberg Limits, and swell tests. Frequency of borings and laboratory testing can be determined once the ISS treatment is completed. The additional borings and testing can be performed by either AEC or a different CMT laboratory, although AEC must be allowed to review the test results if the testing is performed by others.

Grade Beams: We recommend that foundation grade beams be founded at least 30 inches below FFE. We recommend that tensile reinforcement be placed in both top and bottom of the beams. The drilled footings and beams should be tied together.

Floor slabs are frequently structurally tied to the grade beams, although this will be at the building designer's discretion. Alternatively, isolating the floor slabs from grade beams with a flexible impervious compound will be beneficial to reduce the potential for slab cracking due to differential soil movement; however, its use will not mitigate the total and differential PVR movements, and the floor slabs are expected to move corresponding to the subgrade soils.

Moisture Barrier: We recommend that a horizontal moisture barrier (minimum 10-mil thick) be placed below the concrete slab to move edge effects away from the slab and mitigate seasonal fluctuations of water content directly below the structure.

5.2 Fill Requirements

5.2.1 Lime Stabilized Clay Fill

Soils Stabilized with Hydrated Lime: AEC prefers that lime-stabilized clay be used as structural fill. Either: (i) imported lime-stabilized clay soils (stabilized offsite before delivery to the project site); or (ii) clay soils

excavated onsite and treated with hydrated lime can be used. Clay soils excavated onsite should first be stabilized with a minimum of 7 percent hydrated lime (by dry soil weight). The amount of hydrated lime provided in this report is for estimation purposes only. The actual amount of lime required for stabilization should be determined by lime-series curve or pH method in a laboratory prior to construction. Lime stabilization should be done in general accordance with Section 02336 of the 2023 COHSCS. AEC prefers using stabilized soil as structural fill since compacted stabilized soil generally has high strength, low compressibility, and relatively low permeability.

Lifts and Compaction: Lime-stabilized clay fill should be placed in loose lifts not exceeding 8 inches in thickness. Backfill within 3 feet of walls or columns should be placed in loose lifts no more than 4-inches thick and compacted using hand tampers, or small self-propelled compactors.

Lime-stabilized clay should be compacted to a minimum of 95 percent of the ASTM D 698 (Standard Proctor) maximum dry unit weight at a moisture content ranging between optimum and 3 percent above optimum.

5.2.2 Select Clay Fill

'Select' Fill: It is AEC's experience that 'select' fill material imported from sand and clay pits in the Greater Houston area is generally non-homogenous (i.e. composed of a mixture of sands, silts, and clays, instead of a homogenous sandy clay material) and of poor quality, and either contains too much sand or has large clay clods with high expansive potential. Use of this non-homogenous soil can result in poor long term performance of structures and pavements placed on top of the fill.

Select fill (whether imported from offsite or is already onsite) should consist of ***uniform***, non-active inorganic lean clays with a PI between 10 and 20 percent, and more than 50 percent passing a No. 200 sieve. Material intended for use as select fill shall not have clay clods with PI greater than 20, clay clods greater than 2 inches in diameter, or contain sands/silts with PI less than 10.

Sand and clay mixtures/blends are unacceptable for use as select fill. Sand/silt with clay clods is unacceptable for use as select fill. Mixing sand into clay or mixing clay into sand/silt is also unacceptable for use as select fill. **Prior to construction, the Contractor should determine if he or she can obtain qualified select fill meeting the above select fill criteria. The testing lab shall *reject* any material intended for use as select**

fill that does not meet the PI, sieve, and clay clod requirements above, unless approved otherwise by AEC.

Lifts and Compaction: All material intended for use as select fill should be tested prior to use to confirm that it meets select fill criteria. The fill should be placed in loose lifts not exceeding 8 inches in thickness. Backfill within 3 feet of walls or columns should be placed in loose lifts no more than 4-inches thick and compacted using hand tampers, or small self-propelled compactors.

Select fill should be compacted to a minimum of 95 percent of the ASTM D 698 (Standard Proctor) maximum dry unit weight at a moisture content ranging between optimum and 3 percent above optimum.

Testing: **If select fill will be used, at least one Atterberg Limits and one percent passing a No. 200 sieve test shall be performed for each 10,000 square feet (sf) of placed fill, per lift (with a minimum of one set of tests per lift), to determine whether it meets select fill requirements.** Prior to placement of pavement or concrete, the moisture contents of the top 2 lifts of compacted select fill shall be re-tested (if there is an extended period of time between fill placement and concrete placement) to determine if the in-place moisture content of the lifts have been maintained at the required moisture requirements.

5.2.3 General Clay Fill

General clay fill can be used beneath structural floor slabs or for fill areas that will not support proposed (or future) structures or pavements (i.e. for mass site grading). AEC recommends that general clay fill consist of a clean, cohesive soil (USCS Classification "CL" or "CH"). Granular soils (i.e. sands, silts, and gravel; not more than 50 percent retained on No. 200 sieve) should not be used as general fill.

General clay fill should be placed in loose lifts not exceeding 8 inches in thickness. The fill should be compacted to 95 percent of the ASTM D 698 (Standard Proctor) maximum dry unit weight at a moisture content ranging between optimum and 3 percent above optimum.

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6.0 CONSTRUCTION CONSIDERATIONS

6.1 Site Preparation and Grading

To mitigate site problems that may develop following prolonged periods of rainfall, it is essential to have adequate drainage to maintain a relatively dry and firm surface prior to starting any work at the site. Adequate drainage should be maintained throughout the construction period. Methods for controlling surface runoff and ponding include proper site grading, berm construction around exposed areas, and installation of sump pits with pumps.

6.2 Construction Monitoring

Site preparation (including clearing and proof rolling), foundation and pavement construction, and subgrade preparation should be monitored by qualified geotechnical professionals to check for compliance with project documents and changed conditions, if encountered. AEC should be allowed to review the design and construction plans and specifications prior to release to check that the geotechnical recommendations and design criteria presented herein are properly interpreted.

7.0 LIMITATIONS

The information contained in this report summarizes conditions found on the dates the borings were drilled. The attached boring logs are true representations of the soils encountered at the specific boring locations on the dates of drilling. Reasonable variations from the subsurface information presented in this report should be anticipated. AEC should be notified immediately if conditions encountered during construction are significantly different from those presented in this report.

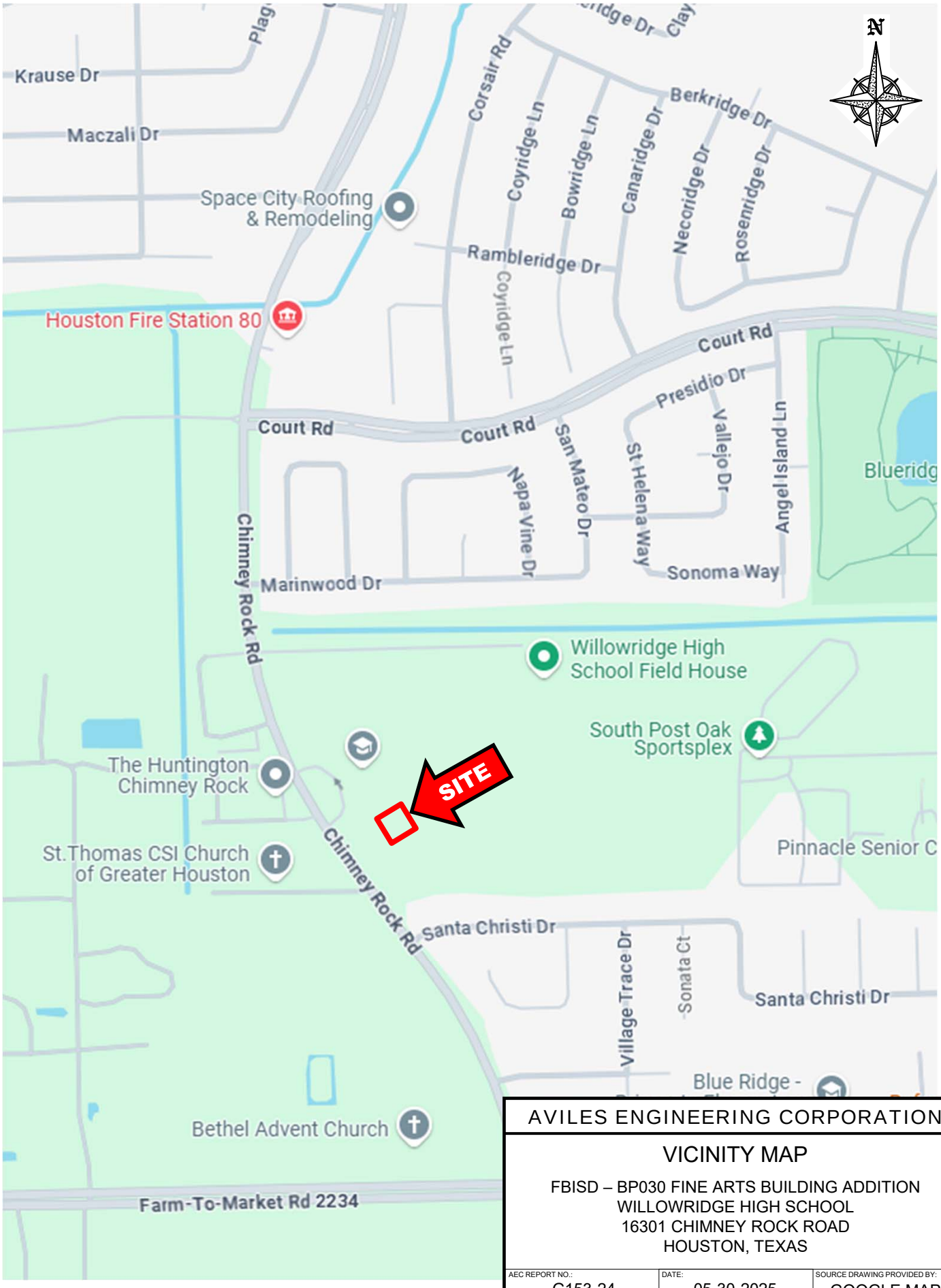
This investigation was performed using the standard level of care and diligence normally practiced by recognized geotechnical engineering firms in this area, presently performing similar services under similar circumstances. This report is intended to be used in its entirety. The report has been prepared exclusively for the project and location described in this report. If pertinent project details change or otherwise differ from those described herein, AEC should be notified immediately and retained to evaluate the effect of the changes on the recommendations presented in this report and revise the recommendations if necessary.

The scope of services does not include a fault investigation. The recommendations presented in this report should not be used for other structures located at this site or similar structures located elsewhere, without additional evaluation and/or investigation.

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ATTACHMENTS

Plate 1	Vicinity Map
Plate 2	Boring Location Plan
Plates 3 and 4	Boring Logs
Plate 5	Key to Symbols
Plate 6	Classification of Soils for Engineering Purposes
Plate 7	Terms Used on Boring Logs
Plate 8	ASTM & TXDOT Designation for Soil Laboratory Tests

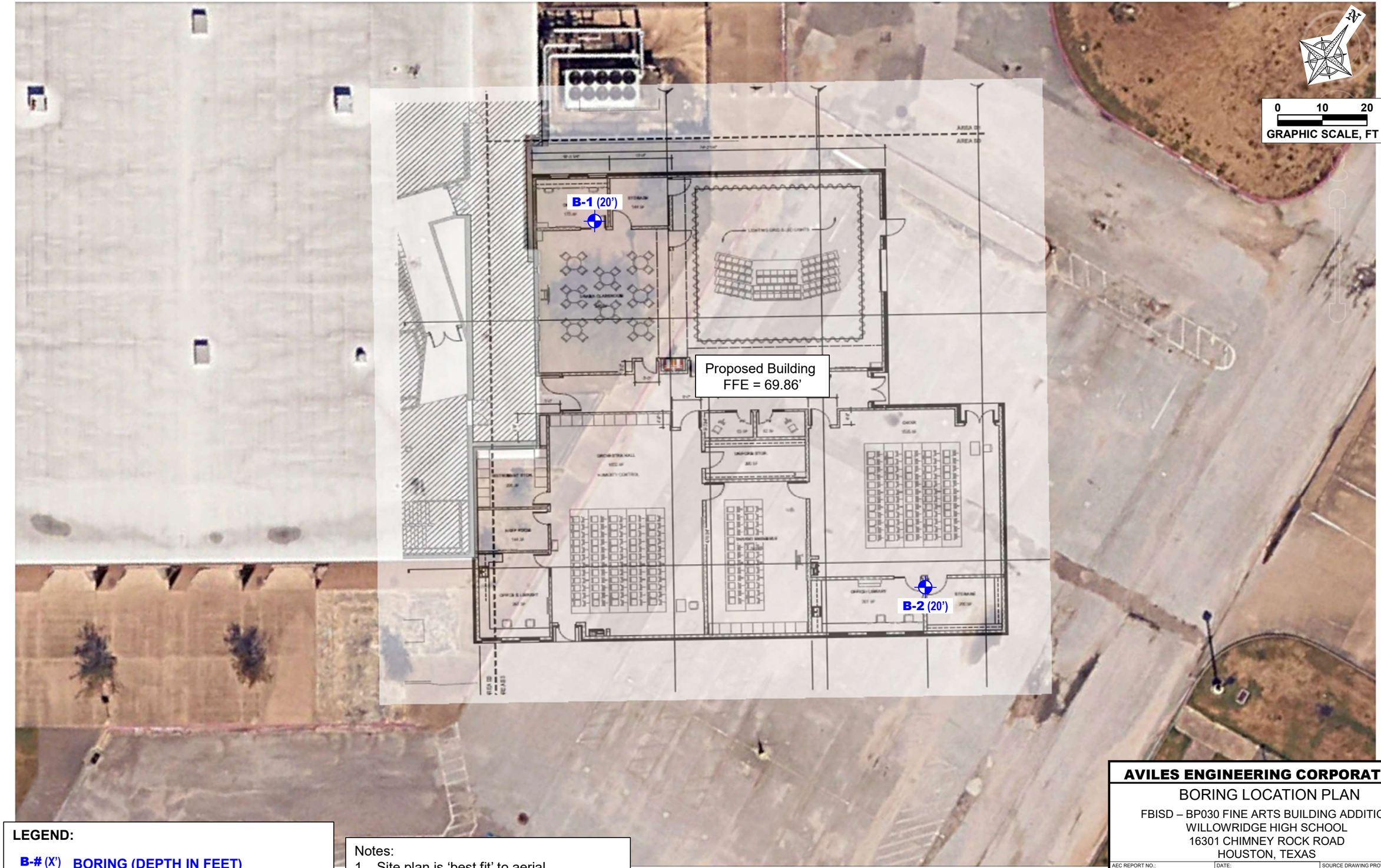


AVILES ENGINEERING CORPORATION

VICINITY MAP

FBISD – BP030 FINE ARTS BUILDING ADDITION
WILLOWRIDGE HIGH SCHOOL
16301 CHIMNEY ROCK ROAD
HOUSTON, TEXAS

AEC REPORT NO.:	DATE:	SOURCE DRAWING PROVIDED BY:
G153-24	05-30-2025	GOOGLE MAPS
APPROX. SCALE:	DRAFTED BY:	PLATE NO.:
N.T.S.	DFP/AN	PLATE 1



LEGEND:

B-# (X') **BORING (DEPTH IN FEET)**

Notes:
1. Site plan is 'best fit' to aerial.
2. Boring locations are approximate.

AVILES ENGINEERING CORPORATION

BORING LOCATION PLAN

FBISD – BP030 FINE ARTS BUILDING ADDITION
WILLOWRIDGE HIGH SCHOOL
16301 CHIMNEY ROCK ROAD
HOUSTON, TEXAS

AEC REPORT NO.:	DATE:	SOURCE DRAWING PROVIDED BY:
G153-24	07-17-2025	GOOGLE/FBISD
APPROX. SCALE:	DRAFTED BY:	PLATE NO.:
1" = 20'	DFP/WLW	PLATE 2

AVLES ENGINEERING CORP. GEOTECHNICAL ENGINEERS

PROJECT: Willowridge High School - Fine Arts Bldg Addition BORING B-1

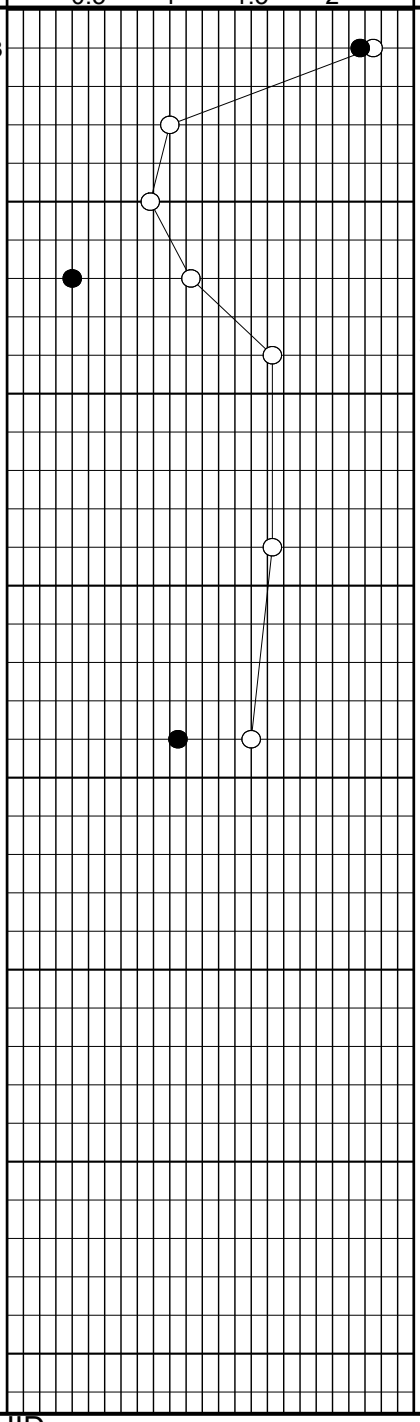
DATE 04/01/2025 TYPE 4" Dry Auger LOCATION See Boring Location Plan

DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	MOISTURE CONTENT, %	DRY DENSITY, PCF	-200 MESH	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
0			Approximate Surface Elevation (feet): 68.8							
			Firm to hard, dark gray Fat Clay (CH), with slickensides		17	104.3				
			-with sand seams, and calcareous and ferrous nodules 0'-2'		32		89.5	73	20	53
5			-with calcareous nodules 6'-8'		31					
					29	92.6				
			Very stiff, tan and gray Fat Clay with Sand (CH)		24		81.8	62	19	43
10			-with calcareous nodules 8'-10' and ferrous nodules 8'-15'							
			-reddish brown 13'-20'		29					
15										
					26	99.6				
20			Termination Depth = 20 Feet							
25										
30										
35										

SHEAR STRENGTH, TSF

△ Confined Compression
● Unconfined Compression
○ Pocket Penetrometer
□ Torvane

0.5 1 1.5 2



BORING DRILLED TO **20** FEET WITHOUT DRILLING FLUID
WATER ENCOUNTERED AT **N/A** FEET WHILE DRILLING ▽
WATER LEVEL AT **N/A** FEET AFTER **Complete** ▼
DRILLED BY **ACE** DRAFTED BY **DFP** LOGGED BY **DM**

PROJECT NO. G153-24

PLATE 3

AVLES ENGINEERING CORP. GEOTECHNICAL ENGINEERS

PROJECT: Willowridge High School - Fine Arts Bldg Addition BORING B-2

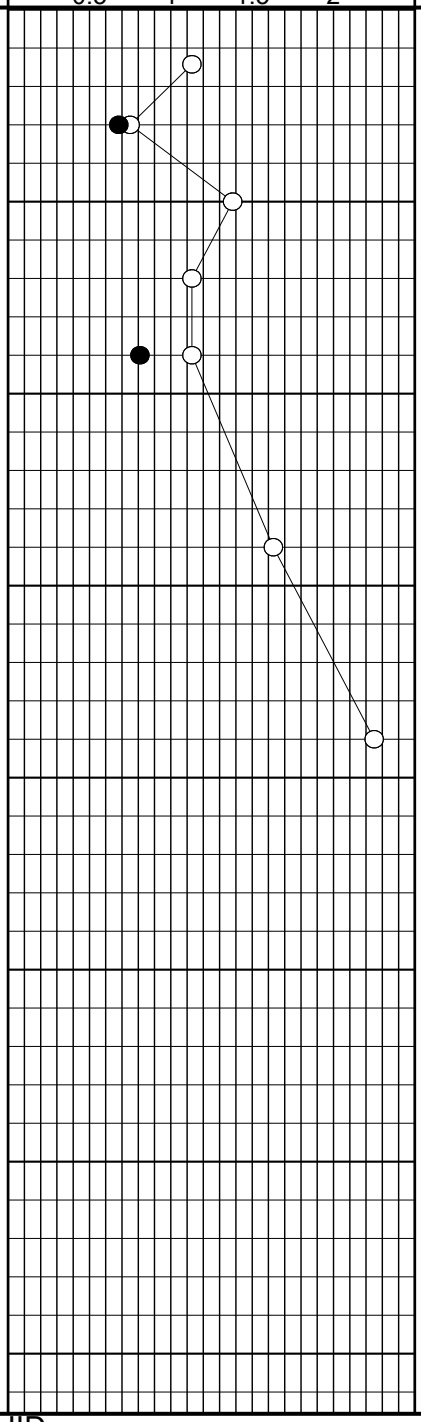
DATE 04/01/2025 TYPE 4" Dry Auger LOCATION See Boring Location Plan

DEPTH IN FEET	SYMBOL	SAMPLE INTERVAL	DESCRIPTION	S.P.T. BLOWS / FT.	MOISTURE CONTENT, %	DRY DENSITY, PCF	-200 MESH	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
0			Approximate Surface Elevation (feet): 68.1							
0			Pavement: 3.25" asphalt							
			Base: 7" sand and gravel base		26		90.3	54	17	37
			Stiff to hard, dark gray Fat Clay (CH), with slickensides		31	92.1				
5			-tan and light gray, with ferrous nodules 4'- 8'		28					
			-with calcareous nodules 6'-8'		24		91.1	62	19	43
			-tan and reddish brown 8'-10'		27	98.9				
10										
			-reddish brown and light gray 13'-20'		25					
15										
					27		99.9	59	23	36
20			Termination Depth = 20 Feet							
25										
30										
35										

SHEAR STRENGTH, TSF

△ Confined Compression
● Unconfined Compression
○ Pocket Penetrometer
□ Torvane

0.5 1 1.5 2



BORING DRILLED TO **20** FEET WITHOUT DRILLING FLUID
WATER ENCOUNTERED AT **N/A** FEET WHILE DRILLING ▽
WATER LEVEL AT **N/A** FEET AFTER **Complete** ▽
DRILLED BY **ACE** DRAFTED BY **DFP** LOGGED BY **DM**

PROJECT NO. G153-24

PLATE 4

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	High plasticity clay
	Paving
	Fill
Misc. Symbols	
○	Pocket Penetrometer
●	Unconfined Compression
Soil Samplers	
	Undisturbed thin wall Shelby tube
	Rock core

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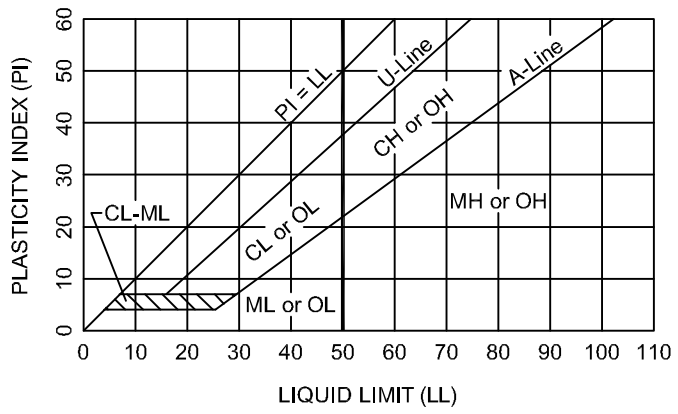
CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM Designation D-2487

MAJOR DIVISIONS				GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (Less than 50% of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)		GW	Well-graded gravel, well-graded gravel with sand
				GP	Poorly-graded gravel, poorly-graded gravel with sand
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart	GM	Silty gravel, silty gravel with sand
			Limits plot above "A" line & hatched zone on plasticity chart	GC	Clayey gravel, clayey gravel with sand
	SANDS (50% or more of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)		SW	Well-graded sand, well-graded sand with gravel
				SP	Poorly-graded sand, poorly-graded sand with gravel
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart	SM	Silty sand, silty sand with gravel
			Limits plot above "A" line & hatched zone on plasticity chart	SC	Clayey sand, clayey sand with gravel
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)		SILTS AND CLAYS (Liquid Limit Less Than 50%)		ML	Silt, silt with sand, silt with gravel, sandy silt, gravelly silt
				CL	Lean clay, lean clay with sand, lean clay with gravel, sandy lean clay, gravelly lean clay
				OL	Organic clay, organic clay with sand, sandy organic clay, organic silt, sandy organic silt
		SILTS AND CLAYS (Liquid Limit 50% or More)		MH	Elastic silt, elastic silt with sand, sandy elastic silt, gravelly elastic silt
				CH	Fat clay, fat clay with sand, fat clay with gravel, sandy fat clay, gravelly fat clay
				OH	Organic clay, organic clay with sand, sandy organic clay, organic silt, sandy organic silt

NOTE: Coarse soils between 5% and 12% passing the No. 200 sieve and fine-grained soils with limits plotting in the hatched zone of the plasticity chart are to have dual symbols.

PLASTICITY CHART



Equation of A-Line: Horizontal at PI=4 to LL=25.5, then PI=0.73(LL-20)

Equation of U-Line: Vertical at LL=16 to PI=7, then PI=0.9(LL-8)

DEGREE OF PLASTICITY OF COHESIVE SOILS

Degree of Plasticity	Plasticity Index
None	0 - 4
Slight	5 - 10
Medium	11 - 20
High	21 - 40
Very High	>40

SOIL SYMBOLS

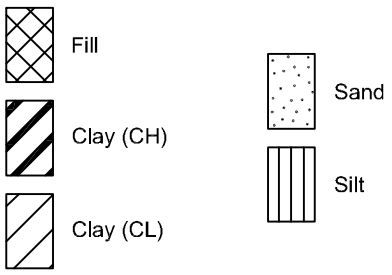


PLATE 6

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TERMS USED ON BORING LOGS

SOIL GRAIN SIZE

U.S. STANDARD SIEVE

6"	3"	3/4"	#4	#10	#40	#200	
BOULDERS	COBBLES	GRAVEL		SAND			SILT / CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	
152	76.2	19.1	4.76	2.00	0.420	0.074	0.002

SOIL GRAIN SIZE IN MILLIMETERS

STRENGTH OF COHESIVE SOILS

Consistency	Undrained Shear Strength, Kips per Sq. ft.	SPT Blowcount
Very Soft	less than 0.25	< 2 bpf
Soft	0.25 to 0.50	2-4 bpf
Firm	0.50 to 1.00	4-8 bpf
Stiff	1.00 to 2.00	8-16 bpf
Very Stiff	2.00 to 4.00	16-32 bpf
Hard	greater than 4.00	>32 bpf

RELATIVE DENSITY OF COHESIONLESS SOILS FROM STANDARD PENETRATION TEST

Very Loose	<4 bpf
Loose	5-10 bpf
Medium Dense	11-30 bpf
Dense	31-50 bpf
Very Dense	>50 bpf

SPLIT-BARREL SAMPLER DRIVING RECORD

Blows per Foot	Description
25	25 blows driving sampler 12 inches, after initial 6 inches of seating.
50/7"	50 blows driving sampler 7 inches, after initial 6 inches of seating.
Ref/3"	50 blows driving sampler 3 inches, during initial 6-inches seating interval.

NOTE: To avoid change to sampling tools, driving is limited to 50 blows during or after seating interval.

DRY STRENGTH ASTM D2488

None	Dry specimen crumbles into powder with mere pressure of handling
Low	Dry specimen crumbles into powder with some finger pressure
Medium	Dry specimen breaks into pieces or crumbles with considerable pressure
High	Dry specimen cannot be broken with finger pressure, it can be broken between thumb and hard surface
Very High	Dry specimen cannot be broken between thumb and hard surface

MOISTURE CONDITION ASTM D2488

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water

SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy. The degree of slickensidedness depends upon the spacing of slickensides and the easiness of breaking along these planes.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Friable	Crumbly, can be easily crushed with light pressure.
Blocky	Clays that have a block-like or polyhedral structure.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil types.
Interlayered	Soil sample composed of alternating layers of different soil types.
Intermixed	Soil sample composed of pockets of different soil types and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of calcium material.

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ASTM & TXDOT DESIGNATION FOR SOIL LABORATORY TESTS

SOIL TEST	ASTM TEST DESIGNATION	TXDOT TEST DESIGNATION
Unified Soil Classification System	D 2487	Tex-142-E
Moisture Content	D 2216	Tex-103-E
Specific Gravity	D 854	Tex-108-E
Sieve Analysis	D 6913	Tex-110-E (Part 1)
Hydrometer Analysis	D 7928	Tex-110-E (Part 2)
Minus No. 200 Sieve	D 1140	Tex-111-E
Liquid Limit	D 4318	Tex-104-E
Plastic Limit	D 4318	Tex-105-E
Standard Proctor Compaction	D 698	Tex-114-E
Modified Proctor Compaction	D 1557	Tex-113-E
California Bearing Ratio	D 1883	-
Swell	D 4546	-
Consolidation	D 2435	-
Unconfined Compression	D 2166	-
Unconsolidated-Undrained Triaxial	D 2850	Tex-118-E
Consolidated-Undrained Triaxial	D 4767	Tex-131-E
Permeability	D 5084 (Method F)	-
Pinhole	D 4647	-
Crumb	D 6572	-
Double Hydrometer	D 4221	-
pH of Soil	D 4972	Tex-128-E
Soil Suction	D 5298	-
Soil Sulfate	C 1580	Tex-145-E
Organics	D 2974	Tex-148-E
Resistivity	G 57-20	TEX-129-E

FBISD
INSPIRE•EQUIP•IMAGINE

Exhibit A

FORT BEND I.S.D. CONSTRUCTION BOND & INSURANCE REQUIREMENTS

It is suggested that this Exhibit be provided to the Contractor's insurance provider.

Contractor shall not commence work until all required bonds and insurance coverages have been obtained and such insurance has been reviewed and accepted by the District. Certificates of Insurance on the current ACORD form shall be issued to the District showing all required insurance coverages.

Bonds Required

Construction, installation and service contracts (including repair and alteration) exceeding $100,000 requires that a 100% Performance Bond be furnished by the successful bidder (contractor). Contracts exceeding $25,000 require that a 100% Payment Bond be furnished by the successful bidder (contractor). All such bids must include a 5% Bid Bond.

Bonds shall be issued by a company authorized to do business in the State of Texas with an A.M. Best Company rating of at least A- X and included on the U.S. Department of the Treasury Listing of Approved Sureties (Dept. Circular 570). The contractor shall be responsible for obtaining bonds and shall absorb any and all costs of such Bonds.

Insurance Required	**Limit Required**
Automobile Liability insurance covering Any Auto	$1,000,000 Combined Single Limit
Comprehensive (Commercial) General Liability insurance including Products, Completed Operations, Independent Contractors, Broad Form Property Damage, Pollution and Blanket Contractual Liability coverages. XCU exclusions to be removed when underground work is performed.	$1,000,000 Occurrence $2,000,000 Aggregate $1,000,000 Personal Injury $ 500,000 Fire Damage $ 5,000 Medical Payments Per Project Aggregate (CG 70 49) Evidence of coverage must be shown on certificates of insurance.
Professional Errors & Omissions Liability insurance may be required from all contractors and licensed or certified as professionals; e.g., engineer architects, insurance agents, physicians, attorneys, banks, financial consultants, etc.	One time project amount; $1,000,000 Occurrence & Aggregate minimum, $5,000,000 Maximum Limit Retroactive Date preceding date of contract must be shown Extended Reporting Period three years past completion of contract
Workers Compensation insurance with limits to comply with the requirements of the Texas Worker Compensation Act Employers Liability insurance	Statutory Limits $1,000,000
Umbrella or Excess Liability insurance (excess of primary General Liability, Automobile Liability and WC Coverage B) Applicable to minimum contract amounts **of $100,000**	100% of Contract Amount up to a maximum of $25,000,000. For construction contracts in excess of $25,000,000 higher limits may be required.

Limits for primary policies may differ from those shown when Umbrella or Excess Liability insurance is provided.

All Risk Builders Risk Property Insurance shall be required for all construction contracts when property of the owner is at risk or in the care, custody and control of the Contractor. Builders Risk insurance shall be required for all construction contracts requiring a bond. All Property insurance shall include coverage against the perils of Flood and Earthquake. (Installation Floater may be substituted when contract involves installation only.)	Contract Limit or Replacement Cost Value of Scope of Work whichever is greater Permission to Occupy granted Deductible: 1% of contract, $50,000 maximum, unless otherwise approved by the Owner.

Insurance Conditions

All insurance coverages shall be issued on an Occurrence basis (except Professional Liability) by companies acceptable to District and licensed to do business in the State of Texas by the Texas Department of Insurance. Such companies shall have a Best's Key rating of at least "A- X".

All certificates must include:

1. The location or description and the bid number, CSP number or Purchase Order number
2. A 30 day notice of cancellation of any non-renewal, cancellation or material change to any of the policies
3. "Additional Insured" on the Property, General Liability, Automobile Liability and Umbrella (Excess) Liability policies naming the District.
4. A "Waiver of Subrogation" clause in favor of the District will be attached to the Workers Compensation, General Liability, Automobile Liability, Umbrella Liability and the Property insurance policies.
5. In addition to certificates of insurance, copies of policy endorsements must be provided (a) listing the District as Additional Insured, and (b) showing waivers of subrogation in favor of the District: CG2010, CG2037, CG2404, CA0070, CA0032, WC0003 or their equivalents.

All insurance must be maintained for one year following substantial completion with Certificates of Insurance provided.

Contractor shall be responsible for payment of all deductibles; the District shall approve the deductibles selected.

If any policy has aggregate limits, a statement of claims against the aggregate limits is required.

The District reserves the right to review the insurance requirements during the effective period of any contract to make reasonable adjustments to insurance coverages and limits when deemed reasonably prudent by District based upon changes in statutory laws, court decisions or potential increase in exposure to loss.

FORT BEND Independent School District
C/o Director – Design & Construction Department
2323 Texas Parkway
Missouri City, TX 77489

BONDING CAPACITY CERTIFICATION LETTER

OWNER
Fort Bend Independent School District
555 Julie Rivers Drive
Sugar Land, TX 77478
281-634-1803

CONTRACTOR
Firm Name .....
Address .....
City, State, Zip Code .....
Phone .....

This letter serves as a certified statement that the Surety Company's authorized bonding capacity for the referenced Contractor will not be exceeded by the inclusion of Contractor's submitted proposal for FBISD's CSP _____, Title of CSP _____.
The present limits on bonding for the referenced Contractor are as follows:

$ ..... each occurrence.
$ ..... Aggregate

Percentage of bonding capacity expended with inclusion of FBISD's CSP _____, Title of CSP ……..%
Amount of ALL projects that the Contractor is currently preparing bid/proposals and/or have not yet been awarded: $.....
(Amount indicated above must be representative of all projects inclusive of delivery methods such as the following but not limited to: Competitive Bids, Competitive Sealed Proposals, Design-Build, Construction Manager at Risk, Job Order Contracting etc.,)

Issuance and approval of any bond shall be predicated on the most current financial and job information available to the underwriter on the date that the bond is issued. The Surety Company hereby certifies that they are duly authorized by certificate of authority issued by the State of Texas Division of Insurance and that they are rated as follows:

A.M. Best Rating: .....

Financial Size Category .....

Notes: This is the <u>only</u> acceptable format for the Surety's Bonding Capacity Certification Letter.

This statement must be notarized (on an original document with an embossed stamp).
Power of Attorney form must be attached.

SURETY COMPANY

Surety Company Name .....
Address .....
City, State, Zip Code .....

Authorized Signature: .....
Date: ...../...../.....

ACKNOWLEDGMENT

State of _____

County of _____

Subscribed and sworn to before me this
_____***day of*** _____ ***2024***

My Commission Expires _____

(Notary Seal)

FORT BEND INDEPENDENT SCHOOL DISTRICT

GENERAL PROVISIONS

For Purchasing Solicitations and Contracts

July 1, 2023

The following General Provisions are issued in accordance with the laws, rules, and policies set forth through the Texas Education Code, Chapter 44, and Fort Bend Independent School District (FBISD or "District") policy and may be amended as required by FBISD. Prospective Vendors are cautioned to read and understand the General Provisions set forth in this document prior to responding to a FBISD Solicitation. Any exceptions to or failure to follow these General Provisions unless otherwise directed within the Solicitation, may be cause for a Vendor's Solicitation Response to be deemed non-responsive and disqualified by FBISD. These General Provisions will take precedence over the terms and conditions within the Solicitation when they are in conflict unless specific exception is noted within the Solicitation.

INDEX

PART I Definitions, Terms and Acronyms…….. Page 2
PART II Solicitation Information and Instructions…….. Page 4
PART III Solicitation Response …….. Page 7
PART IV Solicitation Evaluation and Award…….. Page 10
PART V Contract Terms, Conditions and Requirements…….. Page 12

FORT BEND INDEPENDENT SCHOOL DISTRICT
GENERAL PROVISIONS

Reference Document Version
Effective Date of July 1, 2023

PART I

DEFINITIONS, TERMS AND ACRONYMS

The following terms may be found in this document or may be used in the normal operations of the District's Purchasing Department.

Term	Definition
Addendum	A document that has been issued by the District that has made material changes, modifications, or deletions of information or specifications of a Solicitation.
Agreement/ Contract	A contract that has been agreed upon and signed by both the District and the Vendor.
Bid	Vendor's response to a Request for Bid or RFB. The term may be used to represent all types of solicitations.
Buyer	The Buyer (FBISD Buyer) is the District's approved business representative for all matters of solicitation, evaluation, award, and administration of a Contract Award. There will be only one appointed Buyer at any time for each purchasing action. Vendors shall address all business/contract issues about a Contract Award to the Buyer.
Alternate or Substitute	A good or service substituted for another by a Vendor with approval of the FBISD Buyer.
Conflict of Interest	A Conflict of Interest shall exist when a Vendor or any affiliated person or business entity provides goods or services under a Contract Award whereby one or more personal, business, or financial interests or relationships exist which would cause a reasonable individual with knowledge of the relevant facts to question the integrity or impartiality of those who are or will be acting under a proposed or existing Contract; or any other facts that exist which may cause the District, at its sole discretion, to determine during the Solicitation or the performance of an existing Contract that the Vendor obtained an unfair competitive advantage favoring the interest of the Vendor or any person with whom the Vendor has or is likely to have a personal or business relationship. Conflicts of interest are further defined in FBISD policy and state law.
Contract Award	The acceptance of a Quote, Bid, Proposal or Offer; a Purchase Order, District Contract Agreement, or other formal notification of award issued by an authorized District official.
Contract Documents	A set of documents that create an Agreement that has been agreed upon and signed by both the District and the Vendor. Contract Documents shall include, without limitation, these General Provisions, the Contract, Purchase Orders, and Service Contracts

Contract Term	The length of time a Contract or Agreement will be available for use by the District.
Contractor	The Vendor(s) who receive a Contract Award for a specific Solicitation.
Debarment	Action taken by the District which prevents a Vendor from participating in the solicitation process for a period of time, usually as a result of improper business practices on the part of the Vendor.
Deliverable	Goods or services which are required by a Contract Award to be provided to the District by a Vendor.
Discount Contract	An awarded Contract where pricing is based on a firm-fixed discount from a Vendor's published price list, priced catalog, or other document that is published for the majority of the Vendor's customers.
District	FBISD
District Business Day	Days the District is officially conducting business (excludes weekends, District observed holidays, etc.).
District Web Site	The official District web site, available at http://www.fortbendisd.com
FBISD	Fort Bend Independent School District
Line-Item Contract	An awarded Contract where goods or services are specified and individually priced.
Notice of Award	A formal, written document issued by an authorized official of the District's Purchasing Department informing a Vendor that it has been selected for the Contract Award based on its Solicitation Response.
Offer	Term used in conjunction with or in place of a Vendor's Solicitation Response.
Professional Services Contract	A Contract awarded for performance of technical, professional, and/or unique services by Vendors which are typically licensed such as medical or medical arts professionals, architects, engineers, or lawyers, as described in Texas Education Code 44.031(f).
Proposal	Vendor's response to a Request for Proposal (RFP).
Purchase Order	Formal order for goods, materials and/or services from a Vendor; a binding commitment for the District to remit payment to the Vendor after the specified goods and/or services, and an invoice for the same are received by the District.
Quote	Vendor's response to a Request for Quote.
RFB	Request for Bids. Solicitation method used for acquiring goods or services for one-time purchases or establishing Term Contracts for acquiring goods or services with aggregate values of $50,000 or greater. This solicitation method is formal, and a legal notice is published at time of issuance. This purchasing method is normally used to establish annual contracts for District-wide goods or services, or major one-time purchases. Award is based on Best Value Determination.
CSP	Request for Competitive Sealed Proposal. Solicitation method used primarily for construction projects. Allows for the use of the formal evaluation process and uses the Best Value Determinations for an award. Negotiations are allowed prior to the award.
RFO	Request for Offer. Solely for technology purchases such as those issued through the State of Texas / Department of Information Resources (DIR) procurement processes. May also be used for sale or lease of property belonging to the District.

RFQ	Request for Quote. Used for small dollar purchases valued at less than $50,000. Solicitation method is typically informal (e.g., phone, fax or email) and solicitation requirements are minimal (no advertisement, minimal response time, etc.). May be used for one-time purchases, or to establish low-dollar Term Contracts. May also be used to compare contract pricing from several different contract vehicles such as cooperatives.
RFP	Request for Proposal. Solicitation method used to acquire highly technical, negotiated goods or services. Standard RFPs will allow for evaluations based on specific criteria established within the RFP. Used primarily for higher dollar valued purchases but may be used for smaller purchases where requirements warrant this Solicitation method. Negotiations are allowed prior to the award.
School Business Days	Days the District is officially conducting school (excludes weekends, District observed holidays, etc.)
Service Contract	An awarded Contract for performance of a service by a Vendor for a specified period of time.
Solicitation	General term used to refer to an RFB, CSP, RFO, RFQ or RFP.
Solicitation Response	Vendor's response to an RFB, CSP, RFO, RFQ, RFP or other Solicitation issued by the District
Solicitation Tabulation	Official tabulation of Solicitation Responses, issued by the Purchasing Department after Contract Award.
Subcontractor	Company or business that has contracted with the prime contractor for performing services for the District. The prime contractor is responsible to the District for the work performed by its subcontractor(s). No contract will exist between the subcontractor and the District.
Term Contract	An awarded Contract for delivery of goods or performance of services by a Vendor for a specific period of time.
Vendor	Bidder, Vendor, Offeror, Proposer, or Contractor.
Vendors of Record	The compiled bid list of Vendors for a specific Solicitation, that is to include Vendors that were selected to receive the Solicitation or have notified the District that they have an interest in the Solicitation and are added to the initial list of Vendors.

PART II

SOLICITATION INFORMATION AND INSTRUCTIONS

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1. **DISTRICT OVERVIEW**
   1.1. Fort Bend Independent School District spans over 170 square miles and is located in the northeast part of Fort Bend County, just southwest of Houston and Harris County. FBISD encompasses the incorporated cities of Missouri City, Sugar Land, Arcola, and Meadows Place, a small portion of Houston, and the communities of Clodine, DeWalt, Rosharon, and Fresno.
   1.2. The District currently has eighty two (82) plus campuses and multiple other sites for administration, athletics, agriculture, and support services.
2. **TYPES OF CONTRACTS** Each Solicitation will identify the type of Contract being advertised. One of the following contracting methods will typically be used, but FBISD reserves the right to use any contracting method it deems to be in the best interest of the District:
   2.1. ***Firm-Fixed Price***
      2.1.1. Prices shall be firm fixed for the term specified in the Contract, and all extensions exercised by the District.
      2.1.2. No increases will be allowed during the Contract term.
      2.1.3. Price decreases are acceptable at any time during the term of the Contract.
   2.2. ***Fixed-Price with a Price Adjustment Allowance***
      2.2.1. Prices shall be firm for a term specified in the Contract.
      2.2.2. Prices can be adjusted based on escalation provisions as identified in the Contract.
      2.2.3. The District reserves the sole right to evaluate the applicability of any price adjustment and accept or reject any formula included in any Solicitation Response or accept or reject any Solicitation Response containing a price adjustment proposal.
      2.2.4. FBISD recognizes this product or service has a price component that may have a commodity with changing costs. The Contractor/Supplier may request a Price Adjustment no more frequently than once each quarter (3-month period).
      2.2.5. A Price Adjustment request must be made in writing and include the reason for the request, documentation supporting the request (i.e., commodity increases), the current pricing, and the requested revised pricing. FBISD will review the Price Adjustment request. If the Price Adjustment is deemed reasonable the Price Adjustment request will be accepted by written acknowledgement. If the request is not accepted the FBISD may entirely reject the request or may counter with revised pricing. In either case the FBISD will provide a written explanation in support of the decision. The Director of Procurement Services may use available indexes (e.g., CPI or PPI) to determine if the requested Price Adjustment is reasonable. Typically, a Price Adjustment that exceeds 5% will not be approved unless very unusual and significant changes have occurred in the industry.
      2.2.6. In the event industry costs decline, FBISD shall have the right to request to receive, from the Contractor, a reasonable reduction in prices/pricing that reflect such cost changes in the industry. FBISD will make a written request to the Contractor for a Price Adjustment in writing with supporting documentation.
   2.3. ***Firm-Fixed Discount Percentage, Discount-from-List, or Cost Markup-From-List***
      2.3.1. Discount or cost mark-up shall be firm fixed for the period specified in the Contract, but prices may vary based upon changes in a District approved price list or other pricing document, by the method and frequency as identified in the Contract.
      2.3.2. Used when the pricing is based on a discount or a cost-plus mark-up percentage from an established, publicly recognized price list.
      2.3.3. Prices shall be from a current Vendor’s price list or a cost-plus percentage add-on to a Vendor's distributor/producers price list.
      2.3.4. Vendor's price list shall be the current price list published and available to and recognized by the trade. A price list specially prepared for a given Solicitation will not be accepted. FBISD, in its sole discretion, shall determine the acceptability of such price lists.

2.3.5. Unless otherwise indicated within the Solicitation, the period of acceptance shall be no earlier than one-twenty (120) District Business Days from receipt and approval.

2.3.6. In order for a price list to be changed, if permitted by the Contract terms, a new or amended price list must be submitted to the District's Purchasing Department by the Vendor and approved in writing by the FBISD Buyer within the Contract time specified prior to the requested price change. Otherwise, the last FBISD approved price list remains in effect until such time that FBISD approves the price change. Price changes will not be approved without vendor's documentation supporting cause for increase.

2.3.7. All prices and discount percentages in Vendor's response shall be firm for the term of this Contract. All price changes for products and/or services provided under this Contract must be approved, in writing, by FBISD prior to taking effect and in the same format as was accepted in Vendor's original response.

2.3.8. If the Solicitation includes the option to extend for additional year(s), price increases for each additional year may be negotiated not to exceed the Consumer Price Index (CPI) in the FBISD area at the time of renewal. Prices may be negotiated to prices below the current pricing.

2.3.9. Vendor agrees to promptly lower the proportionate price of any product purchased through this Contract following a reduction in the price the Vendor is paying suppliers.

2.3.10. Prices for this type of Contract cannot be increased during the first year of the contract. For periods beyond year one, prices cannot be increased for 30 days after the Contract renewal commences unless otherwise specified in the Solicitation. Price reductions shall be offered immediately upon becoming available to a Vendor at any time after award.

The following documentation shall be provided to support a request for a price change:

- justification for change/increase
- terms and conditions
- market conditions
- manufacturers'/distributors' impact if any

All price decreases shall be allowed for all products and/or services.

2.3.11. ***Pricing, Purchase Orders, Invoices, and Payments***

If pricing for products or services available under this Contract are provided at a lower price to an eligible Customer who is not purchasing those products or services under this Contract or any other entity or consortia authorized by Texas law to sell said products and services to eligible Customers, then the available Customer Price in this Contract shall be adjusted to that lower price. This requirement applies to products or services quoted by Vendor or its resellers under this contract for a quantity of one (1) under like terms and conditions and does not apply to volume or special pricing purchases. This Contract shall be amended within ten (10) business days to reflect the lower price.

3. **CONFLICT OF INTEREST**

3.1. ***Disclosure of Certain Relationships with Local Government Officials***

3.1.1. Any individual or business entity that contracts or seeks to contract for the sale or purchase of property, goods, or services with FBISD must file a Vendor Conflict of Interest Questionnaire with the FBISD Purchasing Office in accordance with Texas Local Government Code Chapter 176, and in the event that a conflict arises, no later than the 7th business day after the recipient becomes aware of facts that require filing.

3.1.2. This requirement applies to a person who is an agent of a vendor in the Vendor's business with the District. The Texas Ethics Commission's website at: www.ethics.state.tx.us/data/forms/conflict/CIS.pdf

3.2. ***Employee***

3.2.1. Pursuant to FBISD Policy CH (Local) Purchasing and Acquisition, and DBD (Local) Employment Requirements and Restrictions, all Vendors must disclose the name of any FBISD employee who owns, directly or indirectly, an interest in the Vendor's firm or any of its branches.

3.2.2. Failure to provide such conflict-of-interest information may be grounds for disqualification of the Solicitation Response or cancellation of a contract resulting from this Solicitation.

3.2.3. Purchase of services or equipment from a business owned in whole or in part by a District employee shall be permitted only when approved by the Superintendent and executed through a documented competitive process.

4. **SOLICITATION PRICING** Solicitation prices must be firm for one hundred twenty (120) days from Solicitation

opening/bid closing date until award unless otherwise specified in the Solicitation.

5. **QUANTITIES** Any quantities listed within the Solicitation are a close approximation based on requirements and available funds, but FBISD reserves the right to purchase more or less than the estimated quantities, at the current Contract price, for the term of the agreement unless otherwise specified in the Solicitation. Unless otherwise agreed in writing, FBISD will engage Contractor on an "as needed if needed" basis and does not guarantee the purchase of any quantity or dollar amount of Services.
6. **REQUEST FOR EXPLANATION / INTERPRETATION**
   - 6.1. Any explanation desired by a Vendor regarding the meaning or interpretation of this Solicitation must be submitted in writing to the Buyer identified in the Solicitation in accordance to the Solicitation instructions , in order to allow a response to all interested Proposers before the submission of a bid.
   - 6.2. The District has provided an email address or method of communication intended for interested Proposers to direct requests for clarification, interpretations, and/or questions of current Solicitations in each respective solicitation.
   - 6.3. All requests must include all contact and Solicitation information to be considered. Failure to provide this information may delay a response from the District. Any interpretations, corrections, additions, or changes to the Solicitation will be communicated to all interested Vendors though the issuance of an Addendum. It is the responsibility of the Vendors, prior to submitting their Solicitation Response, to determine whether an Addendum has been issued. All Vendors shall comply with the requirements specified in any Addendum(a) issued by the District.
   - 6.4. Once a request is received, a notification of receipt by the District will be forwarded to the Vendor's contact email address.
7. **DELIVERY TERMS**
   - 7.1. All goods or products included in the Solicitation shall be F.O.B. ("Free on Board") destination full freight allowed, unless otherwise indicated within the Solicitation.
   - 7.2. All goods or products will be considered full freight prepaid and allowed and included in the unit price.
8. **SUPPLIER DIVERSITY INITIATIVE** The FBISD Supplier Diversity Initiative (SDI) ensures that the District will use its best efforts to encourage small businesses to participate in current and future purchasing of all goods and services.
   - 8.1. ***Program Definitions***
     - 8.1.1. *"Small Business"* is defined as a business entity which is independently owned and operated, and which is not dominant in its field of operation. The business employs less than 50 employees and/or has less than $3 million in annual business volume from this local operation.
   - 8.2. ***Certification***
     - 8.2.1. Any business wishing to be identified by FBISD as a small business shall be certified as such by the:
       - 8.2.1.1. Port of Houston Authority SBE Certification.
       - 8.2.1.2. Metropolitan Transit Authority of Harris County (METRO) SBE Certification.
       - 8.2.1.3. City of Houston SBE Certification; or
       - 8.2.1.4. Small Business Administration - SBA 8A (if authorized by the District for a particular procurement).

9. **SAMPLE REQUIREMENTS**
   - 9.1. The District may require a sample of a product at any time for evaluation and testing, from a Vendor participating in a Solicitation process or a Vendor supplying items to the District under contract.
   - 9.2. The Vendor should not submit a sample with the Solicitation Response unless directed to do so.
   - 9.3. ***Request of Sample***
     - 9.3.1. If it is determined that a sample is required as part of the Evaluation Process, the requirement will be issued in writing to the Vendor by the Buyer.
     - 9.3.2. Samples must be received by the District's Purchasing Office by the deadline established in the Buyer's written notification.
     - 9.3.3. A representative sample of the item(s) offered must be provided. Award recommendations will be based on samples and any future items ordered will be of the same quality and grade of the sample submitted.
     - 9.3.4. The Vendor will cover all costs in shipping and providing the sample product to the District.
     - 9.3.5. Failure to provide a requested sample may disqualify the Vendor from further consideration in

award of the associated Solicitation item.

9.3.6. If a sample is found to not meet the Solicitation specifications or the intended purpose of the product, the associated Solicitation item will be disqualified.

9.4. ***Sending of Samples***

9.4.1. If a sample is required by the District, samples must be clearly marked with the following information:

9.4.1.1. The word "Sample" in large print;

9.4.1.2. The name of the company submitting the sample; and

9.4.1.3. The number and title of the Solicitation or Contract.

9.5. ***Return of Samples***

9.5.1. Unless specifically requested, all samples provided shall become the property of FBISD.

9.5.2. If the sample is required by the Vendor to be returned, any and all costs associated with the return of the sample will be the responsibility of the Vendor. FBISD shall not be liable for any damage to the sample.

PART III
SOLICITATION RESPONSE

1. **PREPARATION OF A SOLICITATION RESPONSE** In preparation of a Solicitation Response, each Vendor shall:
   - 1.1. Furnish all information required by the Solicitation by the due date and time.
   - 1.2. Authorized Signature
     - 1.2.1. Solicitation Responses must be signed and/or submitted only by individuals who have been given authority to bind the Vendor under contract.
   - 1.3. Have all erasures or other changes initialed by the signer of the Solicitation Response.
   - 1.4. Solicitation Responses submitted on other forms or with different terms or provisions may be deemed non-responsive by FBISD and disqualified.
   - 1.5. Unless otherwise instructed by the Solicitation, Vendors shall submit the lowest and best price, F.O.B. destination, freight prepaid and allowed, on each item, including packaging and transportation.
   - 1.6. An unsigned Solicitation Response will be deemed non-responsive by FBISD and disqualified. Solicitation Responses cannot be signed after the Solicitation opening time even though the Vendor or a representative is present at the Solicitation opening.
   - 1.7. By submitting a proposal vendor you are acknowledging that you agree to the terms and conditions of the proposal and incorporated here by reference. An unsigned Solicitation Response will be deemed non-responsive by FBISD and disqualified. Solicitation Responses cannot be signed after the Solicitation opening time even though the Vendor or a representative is present at the Solicitation opening.
   - 1.8. By submitting a proposal vendor agrees to any Terms & Conditions of this solicitation and in case of
   - 1.9. conflict with other documents provided by the vendor, these Terms and Conditions take precedence and prevail unless specifically identified and changes are signed by both parties.
   - 1.10. All Solicitation Responses and accompanying samples or documents of any kind become the property of FBISD and are subject to the Texas Public Information Act The District will be under no obligation to return any part of a Solicitation Response to a Vendor.
2. **ADDENDA**
   - 2.1. Should an addition or correction become necessary after a Solicitation is issued, an Addendum or notice of the availability of such an Addendum will be posted on the District e-bidding Web Site https://fortbendisd.bonfirehub.com/portal/openOpportunities. Vendors of Record with FBISD are those Vendors having received a copy of the initial Solicitation or notice of the availability of a copy on-line.
   - 2.2. Vendors who do not submit a Solicitation response without receipt of all Addenda issued, may be deemed non-responsive by FBISD, and disqualified.
   - 2.3. Vendors shall acknowledge an Addendum by returning the Addendum in a separate response, or with the Solicitation, or by physically noting the change or addition on the Solicitation Response with a notation acknowledging the Addendum.
   - 2.4. Failure to return or acknowledge an Addendum may be deemed non-responsive by FBISD and result in disqualification.
3. **BRAND NAME AND PRODUCT NUMBER REFERENCE**
   - 3.1. If applicable to the Solicitation, the use of referenced brand/stock numbers in a Solicitation are for brevity in establishing minimum specifications and are not intended to be restrictive.
   - 3.2. “Buyers approved equal” indicates that the District will consider other manufacturer’s product that meets or exceeds the published specifications. The District shall make the final determination of acceptable substitutions.
   - 3.3. Unless no exception is made to the reference manufacturer’s product, the alternate manufacturer, trade and/or brand name and number must be indicated for each item bid. The Bidder will be required to forward any illustrations that render its equivalency. Any additional specifications must reference the line-item number that it corresponds to.
   - 3.4. Products of inferior quality will be rejected.
   - 3.5. If the bid space is left blank, the District will consider it a ‘no bid’.
4. **ATTACHMENTS**
   - 4.1. Vendors may include attachments to describe goods or services being offered and/or to exhibit that products offered meet all written specifications; however, Vendors shall not submit samples unless requested to do so.
   - 4.2. Page and paragraph numbers shall properly reference each page of an attachment in the Solicitation

Response.

4.3. The name of the Vendor submitting the attachment shall also be prominently displayed on each page of the attachment.

4.4. No terms or conditions recorded on any attachment will be considered binding unless specifically made a part of the Solicitation Response in writing and specifically incorporated into the resulting contract.

4.5. **WARNING:** ***Any added terms or conditions may result in disqualification of a Solicitation Response, e.g., Solicitation Reponses subject to laws of a state other than Texas, requirements for prepayment, limitations on remedies, waiver of immunities, change in venue, etc.***

5. **SITE VISITATION**

5.1. The Vendor shall be responsible for fully understanding the scope of the Solicitation, and if considered applicable to the goods or services being solicited, the District recommends that Vendors visit the FBISD site and examine the space and/or equipment to be serviced. Vendors shall obtain prior FBISD Buyer approval for any site visit.

5.2. Pre-submittal conferences may be established by the District to allow Vendors access to the associated facility.

5.3. The prospective Vendor shall carefully examine the venue(s), specifications, and requirements.

5.4. If necessary, Vendors shall secure additional information from the FBISD Buyer that may be requisite to a clear and full understanding of the work.

6. **REFERENCES**

6.1. If required in the Solicitation, the Vendor is to submit references that have contracted with their company to provide like products or services. It is recommended that the Vendor include school districts or other local government organizations similar to FBISD in size and structure as references, if possible. References should include the company name, address, contact name, phone number and email address.

6.2. The District reserves the right to use the results of the reference check in the evaluation process, including information obtained from references other than those identified by the Vendor. A negative reference or references may cause a Solicitation Response to be rejected.

7. **CERTIFICATIONS AND REPRESENTATIONS**

7.1. The Vendor shall complete, sign and provide all documents as required by the Solicitation. Document must be signed by an authorized representative who may legally bind the company and is to be included with the Solicitation Response for the response to be considered. Failure to sign and submit required documents may disqualify the Solicitation Response

7.2. Based on the type of Solicitation, the forms that may be required are:

7.2.1. Felony Conviction Notice. State of Texas Education Code, Section 44.034 requires that a person or business entity (excluding publicly held corporations) that enters into a Contract with the District give advance notice to the District if the person or an owner or operator of the business entity has been convicted of a felony.

7.2.2. Proposal Submission Form (Proposals only).

7.2.3. Conflict of Interest Disclosure. Prior to and as a condition of doing business with FBISD, Vendor shall complete a Conflict-of-Interest Disclosure Form, and shall disclose any business relationship, past or present, with a sitting Board member or FBISD employee. Failure to disclose the existence of any such relationship may disqualify the Solicitation Response or be grounds for termination of an award or agreement.

7.2.4. Relationships with Foreign Entities.

7.2.4.1. In accordance with Texas Government Code Chapter 2252, Subchapter F, Vendor shall certify that it is not a company identified on the Texas Comptroller's list of companies known to have contracts with, or provide supplies or services to, the Government of Iran, the Government of Sudan, or a foreign organization designated as a Foreign Terrorist Organization by the U.S. Secretary of State.

7.2.4.2. Vendor shall certify, pursuant to Texas Government Code Chapter 2270, neither Vendor, nor any affiliate, subsidiary, or parent company of Vendor, if any (the "Vendor Companies"), boycotts Israel, and Vendor agrees that Vendor and Vendor Companies will not boycott Israel during the term of any award or agreement.

7.2.5. W-9 Certificate. The Vendor is required to register in Bonfire and upload a copy of a W-9 Vendor Identification Number Certificate to expedite the payment process if awarded a Contract. A copy of the form can be found at https://www.irs.gov/forms-pubs/about-form-w-9.

7.2.6. If you have previously submitted your W9, you are required to submit an updated version if there are

any changes.

7.2.7. Suspension and Debarment Certification
7.2.8. EDGAR Certifications
7.2.9. Data Protection Addendum This document is required for Solicitations that involve the District's data
7.2.10. Vendor ACH/Direct Deposit Authorization Form will be requested if awarded a Contract.
7.2.11. Certification Regarding Lobbying
This certification is a prerequisite for making or entering into a transaction imposed by Section 1352, Title 31, US Code.
7.2.12. Certificate of Residency
Texas Education Code Chapter 2252, Subchapter A addresses non-resident contractors. As a result, Fort Bend ISD obtains this form as part of the Solicitation Response to determine the residency of its proposers.

8. **SUBMISSION OF SOLICITATION RESPONSES**
8.1. A Solicitation Response shall represent a true and correct statement and shall contain no cause for claim of omission or error.
8.2. If directed by the Solicitation, the Vendor shall provide any and all certifications, forms, and documents as stated within the Solicitation.
8.3. Responses
8.3.1. Solicitation Response must contain:
8.3.1.1. The signed proposal document page of the Solicitation;
8.3.1.2. Specification documents, if applicable;
8.3.1.3. The certifications and representations as applicable;
8.3.1.4. Any additional documents required by the Solicitation.
9. **WITHDRAWAL OF A SOLICITATION** Any Vendor who, in FBISD's sole discretion, is extended the privilege of withdrawing a Bid because of having proven mechanical error in the Solicitation Response may not be considered for an Award on similar items for a length of time deemed appropriate by the District, usually considered to be one (1) year or longer.
10. **SOLICITATION RESPONSE CERTIFICATION** By signing and submitting a Solicitation Response, the Vendor certifies and represents to FBISD that:
10.1. The Solicitation Response has been reviewed by an authorized representative of the company or firm submitting the bid, proposal, offer or other Solicitation Response document.
10.2. The Vendor's firm or any of its individuals have not colluded, conspired, connived or agreed, directly or indirectly, with an entity or person, to put in a sham Solicitation Response or bid or to refrain from responding to the Solicitation, and have not in any manner, directly or indirectly, sought by agreement or collusion, or communication or conference, with any person, to fix its Solicitation Response price, or that of any other vendor, or to fix any overhead, profit or cost element of said Solicitation Response price, or of that of any other Vendor, or to secure any advantage against FBISD or any person interested in the Solicitation, and that all statements in its Solicitation Response are true;
10.3. The contents of the Solicitation Response as to price, terms and conditions or other details of the Solicitation Response have not been communicated by the Vendor or by any employee or agent to any other person engaged in this type of business prior to the official opening of the Solicitation; and
10.4. Vendor has read and understands the Solicitation and these General Conditions (including without limitation, the Contract Terms, Conditions, and Requirements set forth in Part V, below).
11. **LATE SOLICITATION RESPONSES**
11.1. Late Solicitation Responses, or components of a solicitation response, will **NOT** be considered under any circumstances.
11.2. A Solicitation Response will be considered late if the Solicitation Response is not received at the Purchasing Department Solicitation Response Desk by the deadline provided in the Solicitation.
11.3. The Purchasing Department will not be responsible for, and no allowances will be made for, misrouting of a Solicitation Response within the District, delays caused by the Post Office, technical delays or problems, courier services, or any other delays.
11.4. The official deadline date and time is determined by the Purchasing Department.
12. **THE DISTRICT IS TAX-EXEMPT**

12.1. FBISD is tax-exempt. Proposal prices should not include taxes.

13. **OPEN RECORDS POLICY**

13.1. FBISD is a governmental body subject to the Texas Public Information Act. Solicitation Responses submitted to FBISD as a result of this Solicitation may be subject to release as public information after contracts are executed or the procurement is terminated. If a Vendor believes that its Solicitation Response, or parts of its Solicitation Response, may be exempted from disclosure under Texas law, the Vendor must specify page-by-page and line-by-line the parts of the Solicitation Response which it believes are exempt. In addition, the Vendor must specify which exception(s) to the Texas Public Information Act are applicable and provide detailed reasons to substantiate the exception(s). Vague or general claims to confidentiality will not be accepted. FBISD assumes no obligation or responsibility relating to the disclosure or nondisclosure of information submitted by Vendor.

14. **INTERPRETATION**

14.1. A Solicitation represents the basis for any Award and supersedes all prior offers, negotiations, exceptions and understandings (whether orally or in writing). Submitted Solicitation Responses should be self-explanatory and should not require any clarification or additional information.

15. **SOLE SOURCE**

15.1. In order to become a Sole Source Vendor, a Vendor must meet the requirements of Texas Education Code § 44.031(j) Sole Source, as described below.

15.1.1. Selected purchases may be exempt from competitive procurement if they meet the established criteria for a sole source purchase:

15.1.1.1. Identification and confirmation that competition in providing the item or product to be purchased is precluded by the existence of a patent, copyright, secret process or monopoly

15.1.1.2. Identification and confirmation that the product is a film, manuscript, book, utility service (including electricity, gas, or water), or a captive replacement part or component for equipment.

15.1.1.3. Sole source does not apply to mainframe data-processing equipment and peripheral attachments with a single item purchase price in excess of $15,000.

15.2. It is incumbent upon the District to obtain and retain documents from the Vendor which clearly delineate the reasons that qualify the purchase to be made on a sole source basis. In order to do business with FBISD as a Sole Source Vendor, FBISD must receive a notarized Sole Source Affidavit along with proof of Vendor's company qualifying as a sole source.

16. **GENERAL CORPORATE AND CONTACT INFORMATION**

Vendors are required to attach all the following in the Solicitation Response:

- Describe the company's official registered name and its principals.
- Provide a brief history of the company, including the year it was established.
- Provide the company's organizational chart.
- Provide the company's Dun & Bradstreet (D&B) number.
- Provide a description of the company's relevant market and the company's position within it.
- State whether the Vendor or the Vendor's ultimate parent company or majority owner: (A) has its principal place of business in this state; or (B) employs at least 500 persons in this state.
- Vendor agrees to provide the District with the following financial information if requested by FBISD at any point during the procurement process, including before or after contract award: If public, the Vendor's income statement, balance sheet, and cash flow for the past three (3) years; if private, the Vendor's audited financial statements for the past two years (if available). A Vendor's failure to provide this financial information may impact the FBISD administration's recommendation to the FBISD's Board of Trustees for the award of the contract.

PART IV

SOLICITATION EVALUATION AND AWARD

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1. **RESERVATIONS** The District expressly reserves the right to:
   - 1.1. Waive minor deviations from specifications, if the District determines that overall cost of the goods or service will be lower and the overall function is improved or not impaired;
   - 1.2. Waive any minor informality or deficiency in any Solicitation procedure;
   - 1.3. Accept, reject, or negotiate modifications in any terms of a proposed Vendor's Solicitation Response, or any parts thereof;
   - 1.4. Waive any formalities or technicalities if deemed in the best interest of the District;
   - 1.5. Reject any or all Solicitation Reponses;
   - 1.6. Cancel the Solicitation;
   - 1.7. Reissue a Solicitation;
   - 1.8. Extend the Solicitation opening time and date, the Contract Award date, or both;
   - 1.9. Specify approximate quantities;
   - 1.10. Increase or decrease the quantity specified in the Solicitation;
   - 1.11. Consider and accept alternate Solicitations, if specified in the Solicitation, when it is considered in the best interest of the District;
   - 1.12. Procure any goods or services by other means;
   - 1.13. Purchase no goods or services;
   - 1.14. Award one or more contracts, in part or in whole, to a single or to multiple prospective Vendors. The decision to award multiple contracts, award only one contract, or to make no awards rests solely with FBISD. FBISD may make multiple awards, and this fact should be taken into consideration by each Vendor;
   - 1.15. Award contracts for individual products or services as may appear advantageous;
   - 1.16. Negotiate separately in any manner necessary to serve the best interests of the District; and
   - 1.17. Be sole judge of quality and equality.
   - 1.18. FBISD assumes no financial responsibility for any costs incurred by prospective Vendors in developing and submitting a Solicitation Response, participating in bid conferences (if any), participating in any negotiation sessions or discussions, or any other costs incurred by Vendors prior to award of a contract pursuant to any Solicitation.
2. **COMPETITIVE SELECTION USING BEST VALUE**
   - 2.1. ***Solicitation***
     - 2.1.1. All formal Solicitations will be evaluated using the Best Value method as defined in Texas Education Code 44.031(b).
     - 2.1.2. The Solicitation will usually indicate the criteria and ranking to be used to determine Best Value. In the absence of criteria in the Solicitation, the criteria in 2.1.3 will be used.
     - 2.1.3. In determining Best Value the District will consider any or all of the following:
       - 2.1.3.1. Purchase price;
       - 2.1.3.2. Reputation of the Vendor and of the Vendor's goods or services;
       - 2.1.3.3. Quality of the vendor's goods or services;
       - 2.1.3.4. Extent to which the goods or services meet the District's needs;
       - 2.1.3.5. Vendor's past relationship with the District;
       - 2.1.3.6. Total long-term cost to the District to acquire the Vendor's goods or services;
       - 2.1.3.7. Any other relevant evaluation criteria specifically listed in the Solicitation;
   - 2.2. ***Award***
     - 2.2.1. Award will not necessarily be made to the Vendor submitting the lowest priced offer.
     - 2.2.2. After Solicitation Responses are received, FBISD may make an Award or Awards without discussion with any Vendor. FBISD reserves the right to conduct interviews, oral presentation, negotiations if applicable, or any other requirements deemed appropriate with only one, with some, or with all Vendors, in compliance with applicable procurement laws. Solicitation Responses should, therefore, be submitted on the most favorable terms.
3. **EVALUATION** The District will evaluate all Solicitations based on the following procedures:
   - 3.1. ***Objective*** Objective evaluation is:

3.1.1. Based on a set of pre-determined criteria using formulas and/or sets of ranges; and
3.1.2. By normal District processes, does not include an evaluation team.

3.2. ***Subjective*** Subjective evaluation is:
3.2.1. Based on a set of pre-determined criteria; and
3.2.2. By normal District processes, includes the use of an evaluation team to determine the scoring.

4. **AWARD OF CONTRACT**

4.1. FBISD will indicate acceptance of a Vendor's Solicitation Response by issuance of a Purchase Order, Contract, or other form of Notice of Award to awarded Vendor(s) at completion of the evaluation of Solicitation Responses and upon approval by the Board of Trustees.

4.2. If the Contract is issued in the form of a Purchase Order, the Purchase Order together with any other documents which the FBISD Buyer has attached and/or referenced as part of the Purchase Order, constitutes an offer by the FBISD Buyer to purchase from the Vendor the goods and/or services indicated, subject to these General Provisions. The Purchase Order, together with these General Provisions, and their attachments and/or referenced documents, is the sole and complete Contract between the District and Vendor with respect to the goods and services ordered and supersedes all prior oral and written understandings. No additional terms or modifications to the Purchase Order proposed by the Vendor in any acknowledgement, sales order, or other form of communication shall be binding on the District. The FBISD Buyer's failure to object to provisions contained in any communication from the Vendor shall not be deemed a waiver of the provisions or an approval of the terms.

4.3. Acceptance of the Purchase Order is conditional on Vendor's consent to the terms and conditions in these General Provisions. FBISD expressly objects to and rejects any terms or conditions in addition to or different from those contained in these General Provisions, whether previously or hereafter proposed in any form from Vendor unless the FBISD Buyer has expressly agreed to them in writing. By submitting a Solicitation Response to the District to provide goods or services, Vendor acknowledges receipt and willingness to accept all terms and conditions contained in these General Provisions.

4.4. ***Order of Precedence***

4.4.1. If a formal Contract, Agreement or Purchase Order is issued, the terms and conditions of the Contract shall be governed in the following order of importance/precedence:

4.4.1.1. The formal Contract, Agreement, or purchase order;
4.4.1.2. These General Provisions;
4.4.1.3. Any Addenda to the Solicitation submitted prior to the opening of the Solicitation;
4.4.1.4. The original Solicitation;
4.4.1.5. The accepted portions of the Vendor's Solicitation Response; and
4.4.1.6. Any subsequent contractual documents agreed upon by both parties.

4.4.2. Failure to accept this obligation may result in the cancellation of any award;

4.4.3. Any damages suffered by the District as a result of the Vendor's failure to Contract shall be recovered from the Vendor.

4.5. ***Partnership and/or Subcontracting*** If the Vendor has joined with one or more business partners or is Subcontracting any work to respond to the Solicitation, FBISD reserves the right to:

4.5.1. Reject the Vendor's offer based on that/those partnerships(s) and/or Subcontractors.

4.5.2. Accept, at its option, subsequent offers with new partnership(s) and or Subcontractors, should the Subcontracting Vendors in the initial offer be unacceptable for any reason.

4.6. ***Multiple Vendors*** FBISD reserves the right to award Contracts to multiple Vendors if such Vendors offer items that are unique and have value to FBISD.

4.7. ***Formation of Contract*** A response to a Solicitation is an offer to contract with FBISD based upon the terms, conditions, scope of work, and specifications contained in the Solicitation and in these General Provisions. A Solicitation Response does not become a contract unless and until it is accepted and executed by FBISD.

PART V

CONTRACT TERMS, CONDITIONS, AND REQUIREMENTS

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1. **GENERAL TERMS**
   - **1.1.** ***Titles***. The awarded Vendor shall be hereby known in the section as “Contractor”.
   - **1.2.** ***Term of Contract, Renewals and Extensions***
     - 1.2.1. The Contract established by the Contract Award shall be in effect from date of award or the commencement date, whichever is later, and shall continue for the term stated in the Contract. Typically, the base term is one year.
     - 1.2.2. Any Purchase Orders dated during the term of the Contract must be honored even if received after the Contract expiration date. Contractors may not specify a "final order" receipt date.
     - 1.2.3. Pricing is established by the date the order is placed unless otherwise stated in the Contract.
     - 1.2.4. Renewal Contracts. In addition to the initial base contract term, the District shall have the right to renew the contract for a period described in the official solicitation. Renewals may be offered for additional terms (for example, one-year base term + 4 one-year renewals = 5/years total) provided both FBISD and Vendor are in mutual agreement.
     - 1.2.5. Short Term Contract Extension.
       - 1.2.5.1. If the District determines that additional time is required to avoid a Contract lapse, it may, at its sole option, extend the Contract in 30-day increments, up to 180 days, under the current Contract pricing, terms and conditions.
       - 1.2.5.2. Such extension will be done in writing prior to the end of the current Contract term.
   - **1.3.** ***Price Escalations*** The prices in Contractor’s Solicitation Response shall be firm for the term of the Contract. The District shall only allow price escalations within a Contract if such provisions were identified within the original Solicitation. Contract renewals will allow for escalation only at the time of renewal and Contractor must submit price escalation, along with a justification for such increase, on manufacturer’s letterhead, using the same format used in Contractor’s Solicitation Response. District shall review escalation amount and determine if escalation is acceptable or not. All price changes shall be subject to the District’s prior written approval.
   - **1.4.** ***Availability of Funds***
     - 1.4.1. Any Agreement or Purchase Order resulting from a Solicitation is contingent upon the continued availability of appropriations and is subject to cancellation by the District, without penalty, either in whole or in part, if funds are not appropriated by Fort Bend ISD’s Board of Trustees or otherwise not made available to the District.
     - 1.4.2. The District's payment obligations are payable only and solely from funds appropriated and available for the purpose of the purchase.
     - 1.4.3. The absence of appropriated or other lawfully available funds may render the Contract Award null and void to the extent funds are not appropriated or available and any Deliverables delivered but unpaid shall be returned to the Contractor.
     - 1.4.4. The District shall provide the Contractor written notice of the failure of the District to make an adequate appropriation for any fiscal year to pay the amounts due under the Contract Award, or the reduction of any appropriation to an amount insufficient to permit the District to pay its obligations.
     - 1.4.5. No penalty shall accrue to FBISD in the event this provision is exercised, and FBISD shall not be obligated or liable for any future payments due or for any damages as a result of termination under this section.
   - **1.5.** ***Confidentiality*** Subject to the Texas Public Information Act and any legal requirements, neither FBISD nor the Contractor shall disclose any confidential information without prior written approval. As applicable, Contractor shall maintain and process all information it receives from the District in compliance with all applicable data protection/privacy laws and regulations and FBISD policies. Contractor and FBISD understand that the Family Educational Rights and Privacy Act (FERPA), 20 U.S.C. § 1232g, governs the privacy and security of educational records and information and agree to abide by FERPA rules and regulations, as applicable. Contractor also acknowledges that FBISD is subject to the Texas Public

Information Act, and Contractor waives any claim against and releases from liability FBISD, its officers, employees, agents, and attorneys with respect to disclosure of information provided under or in this Contract or otherwise created, assembled, maintained, or held by Contractor and determined by FBISD, the Attorney General of Texas, or a court of law to be subject to disclosure under the Texas Public Information Act.

1.6. ***Federal Funding*** The following shall be applicable to Solicitations that are funded by federal funds:

1.6.1. This section is applicable only for products or services to be paid with federal funds.

1.6.2. If federal funds will be used to pay for products of services, the Parties understand and agree the Agreement is subject to appropriation, approval, and disbursement of such funding by the United States federal government and its funding administrators, including, but not limited to, the Texas Education Agency. As applicable, the Parties agree to comply with any terms, conditions, and policies related to the use of federal funds, including, but not limited to, the Education Department General Administrative Regulations ("EDGAR") and any other requirements related to applying for, receiving, managing, and reporting federal funds. Contractor shall complete the required "EDGAR Certifications." Noncompliance or misrepresentation regarding this certification may be grounds for termination of an Agreement.

1.6.3. If FBISD does not receive sufficient funding, upon written notice to Contractor, FBISD may terminate an Agreement without penalty or further obligation to Contractor at the end of the period for which funding is available.

1.6.4. All contracts paid with federal grants shall be effective only during the period of availability of the funds identified in the Notice of Grant Award ("NOGA"). An Agreement is effective only after the NOGA is issued.

1.6.5. Federal Law (A-102) Common Rule and (A-110) OMB Circular prohibits non-federal entities, including school districts, from contracting with or making sub-awards under covered transactions to parties that are suspended or debarred or whose principals are suspended or debarred. Covered transactions include procurement Contracts for goods or services equal to or in excess of $100,000 and all non-procurement transactions (e.g., sub-awards to sub-recipients). Contractors receiving individual awards for $100,000 or more and all sub-recipients must certify that the organization and its principals are not suspended or debarred. By signature of the Solicitation, the Contractor affirms that neither it nor its principals are suspended or debarred by a federal agency.

1.7. ***Contract Kick-off Meeting***

1.7.1. The District reserves the right to require the Contractor(s) to meet with District representatives prior to the start of the Contract.

1.7.2. The meeting, if any, shall include, at a minimum, discussion of the performance requirements, service specifications, expectations of professionalism, and access issues, if necessary.

1.8. ***Periodic Performance Reviews***

1.8.1. The District reserves the right to require periodic performance reviews with the Contractor(s).

1.8.2. These reviews shall evaluate at a minimum, the Contractor's ability to:

1.8.2.1. Provide goods or perform services within the required specifications and/or performance requirements;

1.8.2.2. Meet the District's schedule; and

1.8.2.3. Perform in a professional manner.

1.9. ***Usage Reports***

1.9.1. The District will have the right to require the Contractor to provide usage reports of the goods or services purchased from the Contractor during the Contract Period. Usage reports will be computer generated format and made available in 5-7 business days after request.

1.9.2. This right may, at the District's option, be extended beyond the end of the Contract term for a maximum of two (2) years.

1.9.3. The reports shall be in a mutually agreed upon format that is useful by the District and made available by the Contractor.

1.10. ***Rights to Work(s) Made for Hire***

1.10.1. All Work(s) Made for Hire, as that term is defined by the U.S. Copyright Law, shall be the sole property of the District. If commissioned by the District, paid or unpaid, to create a design, artwork, or custom-made product or service, the District shall be sole owner of any copyrights available for the end product.

1.10.2. Contractor hereby assigns all its rights, title and interest in any and all Work(s) Made for Hire and all drafts thereof, including all worldwide copyright ownership rights in the Work(s) Made for Hire, to the District.

1.10.3. The Contractor shall turn over all relevant items relating to the Work Made for Hire, physical or electronic, to the District upon request. The District has the right to legible and complete copies of any and all such work papers upon the District's request.

1.11. ***Disclosure of Intellectual Property Produced***

1.11.1. Contractor shall promptly disclose to the District all copyrights, trademarks, service marks, and/or patents ("Intellectual Property") which Contractor or Contractor's employees, Subcontractors, or Subcontractor's employees may produce, either solely or jointly with others, during the course of the services performed under the Contract.

1.11.2. All such Intellectual Property shall automatically become the property of the District.

1.11.3. In addition, Contractor shall promptly disclose to the District all Intellectual Property to which Contractor may acquire rights in connection with the performance of the services hereunder.

1.11.4. Any disclosure under this paragraph shall contain sufficient technical detail to convey a clear understanding of the Intellectual Property, and shall identify any publication, sale, public use, or impending publication thereof.

1.11.5. Promptly upon request, Contractor shall supply such additional information related to the Intellectual Property as the District may require.

1.11.6. Modification and Derivative Works.

1.11.6.1. The District shall have the right, in its sole discretion, to independently modify and/or create derivative works of any Intellectual Property incorporated in the services for the District's own purposes and use, through the services of its own employees or independent contractors.

1.11.6.2. The District shall own all Intellectual Property Rights to such modifications and/or derivative works.

1.11.6.3. Contractor shall comply with all laws and regulations relating to Intellectual Property. Contractor represents and warrants to the District that Contractor shall not infringe upon any Intellectual Property Rights of any third party. **CONTRACTOR SHALL INDEMNIFY AND HOLD FBISD HARMLESS FROM ALL CLAIMS, LIABILITIES, COSTS, SUITS OF LAW OR IN EQUITY, EXPENSES, ATTORNEYS' FEES, FINES, PENALTIES OR DAMAGES ARISING FROM CLAIMED INFRINGEMENT OF ANY INTELELCTUAL PROPERTY IN CONNECTION WITH THE CONTRACT.** Contractor's obligations under this clause shall survive acceptance and payment by FBISD.

1.11.6.4. Contractor shall require its employees to execute any agreements, assignments, licenses or other instruments, and to provide information related to Intellectual Property, as may be necessary to effectuate the provisions of this Contract.

1.11.6.5. Contractor shall require its Subcontractors and Suppliers to execute any agreements, assignments, licenses or other instruments, and to provide information related to Intellectual Property, as may be necessary to effectuate the provisions of this Contract.

1.12. ***Gratuities and Bribes***

1.12.1. The District may, by written notice to the Contractor, cancel a Contract without liability to the District if it is determined by the District that gratuities or bribes were offered or given by the Contractor or any principle, agent or representative of the Contractor to any officer or employee of the District with a view toward securing the Contract or securing favorable treatment with respect to the awarding or amending or the making of any determinations with respect to the performing of such Contract.

1.12.2. In the event the Contract is canceled by the District pursuant to this provision, the District shall be entitled, in addition to any other rights and remedies, to recover or withhold the amount of the cost incurred by the Contractor in providing such gratuities.

1.13. ***Delays by the District*** The District will have the right to delay a scheduled delivery or other service performance dates by written notice to the Contractor if the District deems such is in FBISD's best interest.

1.15. ***Delays by the Contractor***

1.15.1. If a Contractor foresees the delay of a scheduled delivery of a product or other service performance date, Contractor shall give timely written notice to the District.

1.15.2. The District may, at its sole discretion, extend the delivery or service date for valid reasons.

1.15.3. The Contractor must keep the District advised at all times of the status of the goods or services.

1.15.4. If the delay will create a burden on the District, the District reserves the right, without liability, in addition to its other rights and remedies, to terminate the Contract by notice effective when received, and to use any other means available to secure the goods or services outside the Contract, and receive reimbursement from Contractor for any loss incurred by the District as a result.

1.16. ***Warranties and Remedies***

1.16.1. Status. The Contractor warrants that any services performed under the terms of the Contract by the Contractor or persons under its employment on FBISD property shall be done as an independent contractor and the persons doing such work shall not be considered employees, agents, joint venturers, or partners of the District. As an independent contractor, Contractor will be solely responsible for determining the means and methods for performing the services and shall furnish all tools, materials, transportation, and personal incidentals necessary in the performance of the services. Contractor shall be responsible for any and all applicable social security and personal income taxes which may become due as a result of any payments made by FBISD and Contractor shall indemnify and hold FBISD harmless in this regard. FBISD and Contractor have no power or authority to assume or create any obligation or responsibility on behalf of the other. Contractor agrees that FBISD has no responsibility for any conduct of any of Contractor's employees, agents, representatives, contractors, or Subcontractors. Contractor shall perform services in accordance with the highest standards of care, skill, diligence and professional competence applicable to contractors engaged in providing similar services.

1.16.2. Price

1.16.2.1. The Contractor warrants the prices offered to the District are no higher than the Contractor's current prices on orders by others for like Deliverables under similar terms of purchase.

1.16.2.2. The Contractor certifies that the prices in the Solicitation Response have been arrived at independently without consultation, communication, or agreement for the purpose of restricting competition, as to any matter relating to such fees with any other firm or with any competitor.

1.16.2.3. In addition to any other remedy available, the District may deduct from any amounts due to the Contractor, and/or otherwise recover from Contractor, any amounts paid by the District for items or services in excess of the Contractor's current prices on orders by others for like Deliverables under similar terms of purchase.

1.16.3. Title

1.16.3.1. The Contractor warrants that it has valid title to all Deliverables furnished under the Contract, and that the Deliverables are free and clear of all liens, claims, security interests and encumbrances.

1.16.3.2. **THE CONTRACTOR SHALL INDEMNIFY AND HOLD THE DISTRICT HARMLESS FROM AND AGAINST ALL ADVERSE TITLE CLAIMS TO THE DELIVERABLES**.

1.16.4. Deliverables

1.16.4.1. The Contractor warrants and represents that all Deliverables shall be free from defects in design, workmanship or manufacture, and conform in all material respects to the specifications, drawings, and descriptions in the Solicitation, to any samples furnished by the Contractor, to the terms, covenants and conditions of the Contract, and to all applicable State, Federal or local laws, rules, and regulations, and industry codes and standards. In addition, Contractor warrants that the Deliverables are suitable for and will perform in accordance with the purposes for which they are intended.

1.16.4.2. Unless otherwise stated in the Solicitation, the Deliverables shall be new or recycled merchandise, and not used or reconditioned. Recycled Deliverables shall be clearly identified as such.

1.16.4.3. Contractor shall assume all liabilities incurred within the scope or consequential damages

and incidental expenses, as set forth in the Contractor or manufacturer's warranties, which result from either delivery or use by the District of the Deliverables with does not meet the specifications of the Contract or the Solicitation.

1.16.5. Warranty Period

1.16.5.1. Unless otherwise specified in the Contract, the warranty period shall be at least one (1) year from the District's acceptance of the Deliverable.

1.16.5.2. If the manufacturer's warranty is less than the required warranty period, the Contractor shall warrant the Deliverable to the full extent as provided by the manufacturer.

1.16.5.3. If during the warranty period, one or more of the above warranties are breached, the Contractor shall promptly, upon receipt of demand, resupply the goods or re-perform the services in accordance with the above standard at no additional cost to the District.

1.16.5.4. All costs incidental to such repair or replacement, including but not limited to, any packaging and shipping costs, shall be borne exclusively by the Contractor.

1.16.5.5. The District will endeavor to give the Contractor written notice of the breach of warranty within thirty (30) days of discovery of the breach of warranty, but failure to give timely notice shall not impair the District's rights under this section.

1.16.6. Failure to Repair or Replace If the Contractor is unable or unwilling to repair or replace defective or non-conforming Deliverables as required by the District, then in addition to any other available remedy, the District may reduce the quantity of Deliverables it may be required to purchase under the Contract from the Contractor, and purchase conforming Deliverables from other sources. In such event, the Contractor shall pay to the District, upon demand, the increased cost, if any, incurred by the District to procure such Deliverables from another source.

Damage Assessment

1.16.6.1. If a Contractor is in default on an order, the District reserves the right to purchase the goods or services in default and charge the increase in price, if any, and cost of handling to the Contractor (the "Damage Assessment").

1.16.6.2. Failure by Contractor to pay a Damage Assessment is cause for Contract termination, at District's sole discretion, and/or debarment of the Contractor from the District's Solicitation list for a minimum of one year.

1.16.7. Transfer of Manufacturer's Warranty

1.16.7.1. If the Contractor is not the manufacturer, and the Deliverables are covered by a separate manufacturer's warranty, the Contractor shall transfer and assign such manufacturer's warranty to the District.

1.16.7.2. If for any reason the manufacturer's warranty cannot be fully transferred to the District, the Contractor shall assist and cooperate with the District to the fullest extent to enforce such manufacturer's warranty for the benefit of the District.

1.16.8. Services The Contractor warrants and represents that all services to be provided the District under the Contract will be fully and timely performed in a good and workmanlike manner in accordance with generally accepted industry standards and practices, the terms, conditions, and covenants of the Contract, and all applicable Federal, State and local laws, rules or regulations.

1.16.9. Limitation of Warranty The Contractor shall not limit, exclude or disclaim the foregoing warranty(ies) or any warranty(ies) implied by law, and any attempt to do so shall be without force or effect.

1.16.10. Delivery of Goods or Performance of Services ***If*** the Contractor is unable or unwilling to deliver goods or perform services in accordance with the terms of the Contract, then in addition to any other available remedy, the District may reduce the amount of the Contract Award due to the Contractor, and purchase conforming goods or services from other sources. In such event, the Contractor shall pay to the District upon demand the increased cost, if any, incurred by the District to procure such goods or services from another source.

1.17. ***Indemnification***

1.17.1. The District shall not be required to indemnify and/or hold harmless the Contractor and/or its agents and employees.

1.17.2. **TO THE FULLEST EXTENT PERMITTED BY LAW, THE CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS THE DISTRICT AND ITS AGENTS, EMPLOYEES, AND TRUSTEES FROM ANY AND ALL CLAIMS, DAMAGES, LOSSES, LIABILITIES, COSTS, SUITS IN LAW OR IN**

EQUITY, FINES, PENALTIES, AND EXPENSES, INCLUDING BUT NOT LIMITED TO ATTORNEY'S FEES, ARISING OUT OF OR RESULTING FROM THE PERFORMANCE OF THE WORK, AND/OR THE ACTS OR OMISSIONS OF CONTRACTOR OR ITS EMPLOYEES , AGENTS, SUBCONTRACTORS, AND/OR ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY ANY OF THEM OR ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE, REGARDLESS OF WHETHER OR NOT IT IS CAUSED IN PART BY A PARTY INDEMNIFIED HEREUNDER, INCLUDING WITHOUT LIMITATION, THOSE ARISING FROM CLAIMED INFRINGEMENT OF ANY PATENT, TRADEMARKS, COPYRIGHT, OR OTHER CORRESPONDING RIGHT(S) RELATED TO ANY ITEM OR SERVICE CONTRACTOR IS REQUIRED TO PERFORM HEREUNDER. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this paragraph.

1.17.3. In any and all claims against the District or any of its agents or employees by any employee of the Contractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor under workers' compensation acts, disability benefits acts or other employee benefit acts.

1.18. ***No Waiver of Immunity*** Contractor acknowledges FBISD is a governmental entity subject to constitutional and statutory protections and immunities. No provision in any contract document shall be construed as a waiver or relinquishment of any governmental immunities or defenses on behalf of FBISD, its trustees, officers, employees, and agents as a result of an award or resulting agreement. Further, any obligation of the District to indemnify or hold harmless is expressly conditioned only to the extent permitted by law.

1.19. ***Invoices and Payment*** The Contractor shall submit separate invoices in duplicate on each Contract Award after each delivery of goods or completion of service. If the District authorizes partial shipments or deliveries it will be shown on the Purchase Order and a separate invoice must be sent for each shipment or delivery made.

1.19.1. Payment to Contractor shall be made only after services are performed and not before. Advance payment to Contractor is strictly prohibited.

1.19.2. Contractor shall submit detailed invoices to FBISD describing the Services rendered, the times when such Services were performed, compensable expenses and the amount due. Invoices shall indicate the FBISD Purchase Order number and shall be itemized and transportation charges, if any, shall be listed separately. A copy of the bill of lading and the freight waybill, when applicable, shall be attached to the invoice. Invoices shall be mailed to FBISD, P.O. Box 1004, Sugar Land, TX 77487-1004, Attention: Accounts Payables Department.

1.19.3. Federal excise taxes, State taxes, or District sales taxes shall not be included in the invoiced amount. The District is not liable for these taxes. The District will furnish a tax exemption certificate upon request.

1.19.4. In accordance with Texas Government Code § 2251.021, payments are due to Contractor within forty-five (45) days after the later of the following: (1) the date the District receives the goods; (2) the date the performance of the service is completed; or (3) the date the District receives an invoice for the goods or services.

1.19.5. Payment terms, including the rate of interest that shall accrue on any overdue payments, are subject to Chapter 2251 of the Texas Government Code.

1.20. ***Right to Assurance***

1.20.1. Whenever one party to the Contract in good faith has reason to question the other party's intent to perform, demand may be made to the other party for written assurance of the intent to perform.

1.20.2. In the event that no assurance is given within the time specified after demand is made, the demanding party may treat this failure as an anticipatory repudiation of the Contract.

1.21. ***Advertising*** The Contractor shall not advertise or publish, without the District's prior written consent, the fact that the District has entered into a Contract with Contractor. Contractor shall not use FBISD's name, logo or other likeness in any press release, marketing material or other announcement without FBISD's prior written approval.

1.23. ***Compliance***: Contractor agrees to observe and abide by all applicable local ordinances and state and federal laws, including but not limited to, the Americans with Disabilities Act; Section 504 of the 1973 Rehabilitation Act; Executive Orders 11246 and 11375 regarding Equal Employment Opportunity, as supplemented in Department of Labor Regulations; the Family Educational Rights & Privacy Act; and Title IX of the Education Amendments of 1972. Contractor further agrees to observe and abide by all FBISD policies and procedures, which can be accessed online at http://pol.tasb.org/Home/Index/483.

2. **CONTRACT AGREEMENTS**

2.1. ***Inclusions***

2.1.1. The Contract shall include these General Provisions, terms and conditions included in the contract, Contract Documents, Purchase Orders and Service Contracts, and supersede any other representations, agreements, arrangements, negotiations, or understanding, oral, or written between FBISD and the Contractor regarding the Contract.

2.1.2. The Solicitation Response, when appropriately accepted by FBISD, shall constitute an integral part of any Contract, equally binding between the Contractor and FBISD. Provided, however, that no different, inconsistent, contradictory, or additional terms included in Contractor's Solicitation Response will become part of this Contract with the exception of Change Orders.

2.2. ***Interpretation***

2.2.1. The Contract Documents are intended by the Contractor and the District as a final, complete and exclusive statement of the terms of their agreement.

2.2.2. No prior arrangements, past performance, oral agreements or other factors between the Contractor and the District shall be relevant to supplement or explain any term used in the Contract Documents.

2.2.3. Although the Contract Documents may have been substantially drafted by one party, it is the intent of the Contractor and the District that all provisions be construed in a manner to be fair to both parties, reading no provisions more strictly against one party or the other.

2.3. ***Jurisdiction and Venue***

2.3.1. The Contract is made under and shall be governed by the laws of the State of Texas, including, when applicable, the Uniform Commercial Code as adopted in Texas, V.T.C.A., Business and Commerce Code, Chapter 1, excluding any rule or principle that would refer to and apply the substantive law of another state or jurisdiction.

2.3.2. All issues arising from the Contract shall be resolved in the courts of Fort Bend County, Texas and the parties agree to submit to the exclusive jurisdiction of such courts.

2.3.3. The foregoing, however, shall not be construed or interpreted to limit or restrict the right or ability of the District to seek and secure injunctive relief from any competent authority as contemplated herein.

2.4. ***Modifications***

2.4.1. The Contract Documents and their terms, covenants and conditions can be modified or amended only in writing, when executed by both parties.

2.4.2. No pre-printed or similar terms on any Contractor invoice, forms, order or other document shall have any force or effect to change the terms, covenants, and conditions of the Contract.

2.5. ***Termination for Default***

2.5.1. In the event of a default by the Contractor, the District shall have the right to terminate the Contract in whole or in part for cause, by written Notice of Termination effective in ten (10) days, unless otherwise specified, after the date of such notice, unless the Contractor, within such ten (10) day period, cures such default, or provides evidence sufficient to prove to the FBISD Buyer's reasonable satisfaction that such default does not, in fact, exist.

2.5.2. In addition to any other remedy available under law or in equity, the District will be entitled to recover all actual damages, costs, losses and expenses, incurred by the District as a result of the Contractor's default, including, without limitation, cost of recovery, reasonable attorneys' fees, court costs, and prejudgment and post judgment interest at the maximum lawful rate.

2.5.3. Additionally, in the event of a default by the Contractor, the District may debar the Contractor from the District's Vendor list.

2.5.4. All rights and remedies under the Contract are cumulative and are not exclusive of any other right or remedy provided by law.

2.6. ***No Cause Termination***

2.6.1. The District also reserves the right to terminate the Contract, with thirty (30) days' advance written notice to Vendor, if the District believes that, in its sole discretion, it is in the best interest of District

to do so. It is understood that the District retains the option to terminate this Agreement for any reason at the end of each contract year without pecuniary risk or penalty. The termination will become effective, and this Agreement shall terminate following the written notification of intent.

2.6.2. The District will pay the Contractor, to the extent of funds appropriated or otherwise legally available for such purposes, for all goods delivered and services performed and obligations reasonably incurred by Contractor prior to the date of termination.

2.7. ***Assignment – Delegation***

2.7.1. The Contract shall be binding upon and to the mutual benefit of the District and the Contractor and their respective successors and assigns, provided however, that no right or interest in the Contract shall be assigned, transferred, subcontracted, mortgaged, pledged, or otherwise disposed of or encumbered in any way by Contractor, and no obligation shall be delegated by the Contractor without the prior written consent of the District.

2.7.2. Any attempted assignment or delegation by the Contractor shall be void unless made in conformity with this paragraph.

2.7.3. The Contract is not intended to confer rights or benefits on any person, firm or entity not a party hereto; it being the intention of the parties that there are no third-party beneficiaries to the Contract.

2.7.4. If the Contractor has sold its business and the Contract is conveyed to another business entity (buyer) in the purchase, the Contractor shall, within three (3) business days of such change, provide the District with documentation that can be legally recognized in a State of Texas court of law, or a public announcement stating the terms of the purchase.

2.9. *Waiver*

2.9.1. No claim or right can be discharged or waived in whole or in part by a waiver or renunciation of the claim or right unless the waiver or renunciation is supported by consideration and is in writing signed by the aggrieved party.

2.9.2. No waiver by either the Contractor or the District to require performance by the other party of the terms hereof shall operate as, or be construed to be, a permanent waiver of any rights or obligations under the Contract, or an express or implied waiver of any other term or breach thereof.

2.10. Captions

2.10.1. The captions herein are for convenience and identification purposes only, and are not an integral part hereof, and are not to be considered in the interpretation of any part hereof.

2.11. Force Majeure

2.11.1. Neither FBISD nor Contractor shall be deemed to have breached any provision of this Contract as a result of any delay, failure in performance, or interruption of service resulting directly or indirectly from acts of God, network failures, acts of civil or military authorities, civil disturbances, wars, energy crise, fires, transportation contingencies, interruptions in third-party telecommunications or Internet equipment or service, other catastrophes, or any other occurrences which are reasonably beyond such party's control.

2.11.2. The parties to this Contract are required to use due caution and preventive measures to protect against the effects of force majeure, and the burden of proving that a force majeure event has occurred shall rest on the party seeking relief under this provision. The party seeking relief due to force majeure is required to promptly notify the other party in writing, citing the details of the force majeure event and relief sought, and shall resume performance immediately after the obstacles to performance caused by a force majeure event have been removed, provided the Contract has not been terminated. Delay or failure of performance, by either party to this Contract, caused solely by a force majeure event, shall be excused for the period of delay caused solely by the force majeure event. Neither party shall have any claim for damages against the other resulting from delays caused solely by force majeure. Notwithstanding any other provision of this Contract, in the event the Contractor's performance of its obligations under this Contract is delayed or stopped by a force majeure event, FBISD shall have the option to terminate the Contract. This section shall not be interpreted as to limit or otherwise modify any of FBISD's contractual, legal, or equitable rights.

2.12. FBISD Property

2.12.1. In the event of loss, damage, or destruction of any property owned by or loaned by FBISD that is caused by Contractor or Contractor's representative, agent, employee, or contractor, Contractor shall indemnify FBISD and pay to FBISD the full value of or the full cost of repair or replacement of such property, whichever is greater, within thirty (30) days of Contractor's receipt of written notice of FBISD's determination of the amount due. If Contractor fails to make timely payment, FBISD may obtain such money from Contractor by any means permitted by law, including, without limitation, offset or counterclaim against any money otherwise due to Contractor by FBISD.

2.13. Notice

2.13.1. Any notice provided under the terms of this Contract by either party to the other shall be in writing and shall be given by hand-delivery or by certified or registered mail, return receipt requested. Notice shall be deemed effective upon receipt. Each party may change the address at which notice may be sent to that party by giving notice of such change to the other party by certified or registered mail, return receipt requested.

2.14. Penalties

2.14.1. If Contractor is unable to provide the goods or services at the prices quoted in Contractor's Solicitation Response or if Contractor fails to fulfill or abide by the terms and conditions of the Contract, FBISD may take the following action(s), in FBISD's sole discretion, and Contractor agrees to comply with FBISD's action(s):

2.14.1.1. insist that Contractor honor the quoted price(s) specified in Contractor's Solicitation Response;

2.14.1.2. have Contractor pay FBISD difference between Contractor's price and the price of the next acceptable Solicitation Response (as determined by FBISD);

2.14.1.3. have Contractor pay the difference between Contractor's price and the actual purchase

price of the good or service on the open market; and/or

2.14.1.4. recommend to FBISD's Board of Trustees that Contractor no longer be given the opportunity to submit a proposal to FBISD and/or that the Contract be terminated.

2.15. Performance

2.15.1. Contractor agrees to use commercially reasonable best efforts to provide the Deliverable(s).

2.16. Performance and Payment Bonds

2.16.1. Contractor agrees to provide performance bonds and/or payment bonds as required by Texas law on specified Contracts and/or projects, as applicable. FBISD may include the performance and payment bonds requirement in the specifications section of any Solicitation if performance bonds and/or payment bonds are required.

2.17. Prevailing Wage Rates

2.17.1. Contractor and all subcontractors of Contractor shall comply with all laws regarding wage rates including, but not limited to, Texas Government Code Chapter 2258 and any related federal requirements applicable to the Contract.

2.18. Title and Risk of Loss

2.18.1. Whenever FBISD is purchasing an item under the Contract, title and risk of loss shall pass upon the later of FBISD's acceptance of the item or payment of the applicable invoice.

2.19. Severability In the event that any one or more of the provisions contained in the Contract shall for any reason be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provisions, and the Contract shall be construed as if such invalid, illegal, or unenforceable provision had never been contained in it.

2.21. Dispute Resolution Any claim, dispute, or matter in controversy arising out of or related to the award or agreement ("Dispute") shall be discussed by the parties in good faith, in an attempt to resolve the Dispute. In the event such Dispute cannot be resolved by good faith discussion between the parties, any such Dispute shall be subject to FBISD's complaint policy (GF Local or other policy designated by FBISD) and the timelines established in the policy. If a party is dissatisfied with the outcome of FBISD's complaint process, then the Dispute shall be subject to mediation as a condition precedent to litigation.

2.22. Contractor Representations If Contractor is a business entity, it represents that: (i) it is duly organized, validly existing and in good standing under the laws of the state of its organization; (ii) it is authorized and in good standing to conduct business in the State of Texas; (iii) it has all necessary power and has received all necessary approvals to execute and perform its obligations in this Agreement; and (iv) the individual executing this Agreement on behalf of Contractor is authorized to do so.

2.23. Criminal History Certification Contractor shall ensure that its employees who (i) have or will have continuing duties related to the contracted services, and (ii) have or will have direct contact with students (substantial opportunity for verbal or physical interaction with students that is not supervised by a certified educator or other professional District employee) have submitted all information necessary for FBISD's LEE Fast Pass process and will comply with any FBISD request for employee information in connection with completing such employee criminal history record search. If Contractor subsequently receives information an employee has a criminal history prohibited under this section, Contractor will immediately remove the employee from contract duties and notify the District in writing within 3 days. Contractor will comply with District objections to the assignment of an employee on the basis of the employee's criminal history. To the extent no individual or employee has or will have direct contact with students, Contractor will ensure the individuals or employees will not have direct contact with students throughout the term of this agreement. Noncompliance or misrepresentation regarding this certification is grounds for immediate termination of this Agreement.

2.24. Conflict of Interest Disclosure Prior to and as a condition of doing business with the District, Contractor shall disclose any business relationship, past or present, with a sitting Board member or District employee. Any such relationship shall be disclosed on Form CIQ provided by the Texas Ethics Commission and currently available at https://www.ethics.state.tx.us/forms/CIQ.pdf. Failure to disclose the existence of any such relationship is grounds for immediate termination of this Agreement.

2.25. Disclosure of Interested Parties (Form 1295) For any agreement that requires action by the District's Board of Trustees, unless excepted by Texas Government Code 2252.908(c), Contractor shall electronically submit a disclosure of interested parties on a form prescribed by the Texas Ethics Commission ("Form 1295") and submit a signed copy of the form with this Agreement. The form is currently available via the Texas Ethics Commission website at https://www.ethics.state.tx.us/tec/1295-Info.htm.

2.26. Felony Conviction Notice Texas Education Code 44.034(a) requires "a person or business entity that enters into a contract with a school district [to] give advance notice to the district if the person or an owner operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony." This notice is not required of a publicly-held corporation. If notice is required of Contractor, then Contractor shall submit a statement providing a person or an owner operator of the business entity has been convicted of a felony and a general description of the conviction and conduct resulting in the conviction of a felony.

2.27. Debarment or Suspension Federal Law (2 CFR Part 180 and Part 200) prohibits non-federal entities from contracting with or making subawards under covered transactions to parties that are suspended or debarred or whose principals are suspended or debarred. Covered transactions include procurement contracts for goods or services equal to or in excess of $25,000 and all nonprocurement transactions (e.g., subawards to subrecipients). Contractor certifies neither Contractor nor its principals are suspended or debarred by a federal agency.

2.28. Entities that Boycott Energy Companies: In accordance with Senate Bill 13, Acts 2021, 87th Leg., R.S., pursuant to Section2274.002 of the Texas Government Code (relating to prohibition on contracts with companies boycotting certain energy companies), Contractor represents and warrants that: it does not, and will not for the duration of the Contract, boycott energy companies. If circumstances relevant to this provision change during the course of the Contract, Contractor shall promptly notify the District.

2.29. Entities that Discriminate Against Firearm and Ammunition Industries: In accordance with Senate Bill 19, Acts 2021, 87th Leg., R.S., pursuant to Section2274.002 of the Texas Government Code (relating to

prohibition on contracts with companies that discriminate against firearm and ammunition industries), Contractor verifies that: it does not, and will not for the duration of the Contract, have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association. If circumstances relevant to this provision change during the course of the Contract, Contractor shall promptly notify the District.

3. **GOODS-RELATED CONTRACTS**

3.1. ***General***

3.1.1. Goods are to be delivered to the required destination(s) within the number of District Business Days as identified within the Solicitation after receipt of order (ARO).

3.1.2. All products shall be delivered F.O.B. destination, full freight allowed unless otherwise indicated within the Contract.

3.1.3. Ordering and direct delivery will involve various locations with FBISD unless otherwise specified within the Purchase Order.

3.2. ***Hours for Delivery***

3.2.1. District Distribution Center (warehouse) delivery hours are 8:00 a.m. to 3:30 p.m.

3.2.2 School campus delivery hours are 9:00 a.m. to 3:00 p.m.

3.3. ***Facilities.*** With the exception of the District Distribution Center, no other facilities have areas available dock-level deliveries.

3.4. ***Inside Delivery*** The Contractor shall make inside deliveries within a facility to a location determined by the District if required within the Solicitation.

3.5. ***Expedited Deliveries***

3.5.1. In case of an urgent need for an expedited delivery by the District, the Contractor is requested to supply the needed material immediately, if possible.

3.5.2. If the Contractor cannot respond, then the emergency requirement may be purchased on the open market. Such purchases shall not be considered a breach of Contract by FBISD or the Contractor.

3.6. ***Packaging of Goods***

3.6.1. The Contractor shall package all goods in accordance with good commercial practice unless otherwise instructed.

3.6.2. Each shipping container shall be clearly and permanently marked as follows:

3.6.2.1. The Contractor's name and address.

3.6.2.2. The District's name, address and purchase order or purchase release number if applicable;

3.6.2.3. Box number and total number of boxes, e.g. box 1 of 4 boxes; and

3.6.2.4. The number of the container bearing the packing slip. The Contractor shall bear all cost of packaging.

3.6.3. All packing slips must include the FBISD Purchase Order number.

3.6.4. Goods shall be suitably packed to secure lowest transportation costs and to conform to requirements of common carriers and any applicable specifications. The District's count or weight shall be final and conclusive on shipments not accompanied by packing lists.

3.7. ***Material Safety Data Sheets*** A Contractor must provide, at no cost to the District, at least one copy of any applicable Manufacturer's Material Safety Data Sheet(s) (MSDS) with each shipment, and upon request, during the term of the Contract. If OSHA or Federal or State laws provide for additional requirements, those requirements shall be met by Contractor, in addition to the MSDS requirement.

3.8. ***Inspection and Testing***

3.8.1. The District expressly reserves all rights under law, including but not limited to the Texas Business and Commerce Code, to inspect the Deliverables at delivery, and up to thirty (30) days after District's first use of the Deliverables, and to reject defective or non-conforming Deliverables.

3.8.2. All goods are subject to inspection and testing by FBISD for compliance with the Contract and/or Solicitation specifications by FBISD.

3.8.3. When products tested fail to meet or exceed all applicable specifications, the cost of the sample used and the cost of any testing shall be borne by the Contractor.

3.8.4. Goods, which have been delivered and rejected in whole or in part, may be, at FBISD's option, returned to the Contractor at Contractor's risk and expense or disposed of in accordance with FBISD's policies.

3.8.5. The Contractor may request that rejected goods be held by FBISD at Contractor's risk for a

reasonable period of time for later disposition at the Contractor's expense.

3.8.6. Latent defects may result in revocation of acceptance of any product.

3.9. ***Substitutions of Goods***

3.9.1. All substitutions of goods require prior written approval of the District.

3.9.2. The District reserves the right to require the Contractor to offer possible substitutes if any material or equipment becomes unobtainable during the term of the Contract.

3.9.3. Outstanding orders are not automatically amended by an approved substitution.

3.9.4. During the Contract term, Contractor may request a substitution of an item if the item is no longer manufactured or has been discontinued or superseded by a replacement model and is no longer available to the Contractor.

3.9.5. Substitution Approval Process. Under the forgoing or similar conditions, the Contractor may, in FBISD's sole discretion, be granted an allowance of an item substitution under the following conditions:

3.9.5.1. The Contractor provides the District Purchasing Office with written verification from the manufacturer that the product is no longer manufactured or has been discontinued or superseded by a replacement model and is no longer available to the Contractor.

3.9.5.2. All substitution requests must be submitted within ten (10) District Business Days after the material facts are known to Contractor.

3.9.5.3. If manufacturer has a substitution model, Contractor must provide product specifications along with a written letter requesting the item be substituted.

3.9.5.4. The substitution must meet or exceed all specification requirements associated with the original Solicitation.

3.9.5.5. If substitutions are made to an item that has accessories, the Contractor must also provide substitutions for accessories as applicable.

3.9.5.6. The Contractor will be expected to supply the substitute item at the same or better price than originally bid, unless the Solicitation provided a price increase provision and the substitute can meet the provision requirements.

3.9.5.7. Substitution will be in effect for the term of the Contract or until another substitution is required.

3.9.5.8. All substitutions must be approved in writing by the Purchasing Office prior to their effect.

3.9.5.9. The District reserves the right to approve and disapprove substitutions or to cancel the Contract or Purchase Order as it relates to the items in its entirety and procure the items by a separate procurement process.

3.10. ***Electrical Items*** All electrical items furnished shall meet all applicable OSHA standards and regulations and bear the appropriate listing from UL, FMRC or NEMA.

4. **SERVICE-RELATED CONTRACTS**

4.1. ***Contractor's Obligations***. The Contractor shall fully and timely provide all Deliverables described in the Contract, Solicitation, and in the Vendor's Solicitation Response in strict accordance with the terms, covenants, and conditions of the Contract and all applicable Federal, State, and local laws, rules, and regulations.

4.2. ***Competence of Contractor***

4.2.1. The Contractor warrants it shall have available the necessary personnel, organization, equipment, and facilities to perform all the services and/or provide all the goods required under a Purchase Order or this Contract.

4.2.2. Only qualified personnel adequately trained in the required services shall be employed by the Contractor.

4.2.3. The Contractor shall obtain all licenses/permits required for the performance of the services.

4.2.4. The Contractor shall employ only orderly and competent workers, skilled in the performance of the services which they will perform under the Contract.

4.2.5. The Contractor, its employees, Subcontractors, and Subcontractor's employees may not use or possess any firearms, alcoholic or other intoxicating beverages, tobacco, illegal drugs or controlled substances while on the job or on the District's property, nor may such workers be intoxicated, or under the influence of alcohol or drugs on the job.

4.2.6. The District reserves the right to prevent, forbid, and/or temporarily or permanently bar any of Contractor's employees, Subcontractors, or Subcontractor's employees from any District facility for whatever reason it determines necessary to maintain the safety, decorum, scheduling and day-to-

day operations of the District.

4.3. ***Licensing and Certification***

4.3.1. If the Contract requires licensing and/or certification to perform services as required, the Contractor shall provide only qualified licensed / certified individuals to perform such tasks.

4.3.2. The Contractor must maintain any required licenses / certification for the duration of the Contract.

4.3.3. The District reserves the right to require the Contractor to show proof of licensing / certification at any time during the Contract Term.

4.4. ***Place and Condition of Work***

4.4.1. Services shall be provided/scheduled as specified or directed by the District.

4.4.2. The District shall provide the Contractor access to the sites where the Contractor is to provide the goods or perform the services as required.

4.4.3. The Contractor acknowledges that it has satisfied itself as to the nature of the District's service requirements and specifications, the location and essential characteristics of the work site(s) the quality and quantity of materials, equipment, labor and facilities necessary to provide the goods or perform the services, and any other condition or state of fact which could in any way affect performance of the Contractor's obligations under the Contract.

4.4.4. The Contractor releases and holds the District harmless from and against any liability or claim for damages of any kind or nature if the actual site or service conditions differ from expected conditions.

4.5. ***Compliance with Laws and Safety Regulations***

4.5.1. The Contractor, its Subcontractors, and their respective employees, shall comply fully with all applicable federal, state, and local safety and health laws, ordinances, rules and regulations in the performance of the services, including but not limited to those imposed by the District and by the Occupational Safety and Health Administration (OSHA), as well as applicable workers' compensation laws, minimum and maximum salary and wage statutes and regulations, prompt payment and licensing laws and regulations.

4.5.2. In case of conflict, the most stringent safety requirements shall govern.

4.5.3. The Contractor shall indemnify and hold the District harmless from and against all claims, demands, suits, actions, judgments, fines, penalties and liability of every kind arising from the breach of the Contractor's obligations under this paragraph.

4.6. ***Security and Background Investigations***

4.6.1. Prior to commencing any work under the Contract, if Contractor contracts with FBISD to provide services, Contractor must certify for each covered employee of Contractor who will have direct contact with students, Contractor has obtained, as required by Texas Education Code Section 22.0834: (a) state criminal history record information from a law enforcement or criminal justice agency or a private entity that is a consumer reporting agency governed by the Fair Credit Reporting Act (15 U.S.C. Section 1681 et seq.) for each covered employee of Contractor employed before January 1, 2008; and (b) national criminal history record information for each employee of Contractor employed on or after January 1, 2008. Contractor must also obtain similar certifications of compliance with Texas Education Code Chapter 22's requirements from any subcontractors on the form provided herein. Covered employees with disqualifying criminal history are prohibited from serving at FBISD; Contractor and any subcontracting entity may not permit a covered employee to provide services at a school if the employee has been convicted of a felony or misdemeanor offense that would prevent a person from being employed under Tex. Educ. Code § 22.085(a) (i.e., Title 5 felony or an offense requiring registration as a sex offender and victim was under 18 years of age or was enrolled in a public school at the time the offense occurred).

4.6.2. The Contractor shall be responsible for ensuring the District is protected from potential threats that may be created by their employees.

4.6.3. If directed by the laws of the State of Texas, the Contractor shall adhere to any requirements that may be legislated during the term of any Contract, or any enacted District policy.

4.6.4. The District will have the right to require Contractor's principles, Contractor's employees assigned to the Contract Award, Subcontractor's principles, and Subcontractor's employees assigned to the Contract, and any other individuals deemed to be providing goods or services for the District to be investigated (including fingerprinting) for criminal records and/or history.

4.6.5. The District reserves the right to prevent, forbid, and/or temporarily or permanently bar Contractor, Contractor's employees, Subcontractors, or Subcontractor's employees from any District facility for

whatever security reason it determines necessary to maintain the safety of District employees and operations.

4.7. ***Subcontracts*** Where a Subcontract may be used, the Contractor shall be fully responsible to the District for all acts and omissions of the Subcontracts just as the Contractor is responsible for the Contractor's own acts and omissions. Nothing in the Contract shall create for the benefit of any such Subcontract any Contractual relationship between the District and any such Subcontract, nor shall it create any obligation on the part of the District to pay or to see to the payment of any moneys due any such Subcontract except as may otherwise be required by law.

4.8. ***District Policy for Work Attire***. The Contractor, its employees, and Subcontractor employees shall not wear any T-shirts or clothing that has offensive language, pictures, or signs. The District prefers Contractors, its employees and subcontractors to wear uniforms with identification badges when on District premises.

4.9. ***Insurance for Services Performed***

4.9.1. ACORD Certificate of Insurance. Prior to providing services as a result of a Contract Award, the Contractor shall provide the District with a completed ACORD Certificate of Insurance providing the below listed coverage or such coverage as may be required in the Solicitation.

Type	Limit
Automobile Liability (Auto) - Covering 'Any Auto'	$1,000,000 Combined Single Limit ($5,000,000 if "For-Hire" motor carrier service)
Comprehensive General Liability (CGL) Including Products, Completed Operations, Independent Contractors, Broad Form Property Damage, Pollution and Blanket Contractual Liability coverages. XCU exclusions to be removed when underground work is performed.	$1,000,000 Occurrence $2,000,000 Aggregate $1,000,000 Personal Injury $ 500,000 Fire Damage $ 5,000 Medical Payments
Professional Errors & Omissions Liability (E & O) may be required from all contractors and licensed or certified as professionals; e.g., engineers, architects, insurance agents, physicians, attorneys, banks, financial consultants, etc.	One-time project amount. $1,000,000 Occurrence and Aggregate minimum $5,000,000 Maximum Limit Retroactive Date preceding date of contract must be shown Extended Reporting Period three (3) years past completion
Workers' Compensation (WC) Limits to comply with the requirements of the Texas Workers' Compensation Act Employers Liability	Statutory Limits $1,000,000
Umbrella or Excess Liability Excess of primary General Liability, Automobile Liability and WC Coverage B May be required for prime construction contractors May be required for non-construction contractors and licensed or certified as professionals; e.g., engineers, architects, insurance agents, physicians, attorneys, banks, financial consultants, etc.	 100% of Contract Amount for all contracts exceeding $100,000, up to $25,000,000 max $5,000,000
Sex Molestation/Abuse Required when service performance permits direct, unsupervised access to students.	$100,000 per claim/$300,000 aggregate

Cyber/Data Liability Required if service involves use of *or* access to District-owned data. Coverage for Notification, Crisis Management, Regulatory Response and Privacy Liability.	Limit determined on per project basis.

4.9.2. **Insurance Conditions** All certificates must include:

1) The location or description and the bid number, CSP number or Purchase Order number
2) A 30 day notice of cancellation of any non-renewal, cancellation or material change to any of the policies
3) Additional Insured on the Property, General Liability, Automobile Liability and Umbrella (Excess) Liability policies naming the District.
4) A "Waiver of Subrogation" clause in favor of the District will be attached to the Workers Compensation, General Liability, Automobile Liability, Umbrella Liability and the Property insurance policies.
5) In addition to certificates of insurance, copies of policy endorsements must be provided (a) listing the District as Additional Insured, and (b) showing waivers of subrogation in favor of the District: CG2010, CG2037, CG2404, CA0070, CA0032, WC0003 or their equivalents.
6) Contractor shall not commence work until all required insurance coverages have been obtained and such insurance has been reviewed and accepted by the District. Certificates of Insurance on the current ACORD form shall be issued to the District showing all required insurance coverages.
7) All insurance coverages shall be issued on an Occurrence basis (except Professional Liability) by companies acceptable to District and licensed to do business in the State of Texas by the Texas Department of Insurance. Such companies shall have a Best's Key rating of at least "A- X".
8) The District reserves the right to review the insurance requirements during the effective period of any contract to make reasonable adjustments to insurance coverages and limits when deemed reasonably prudent by District based upon changes in statutory laws, court decisions or potential increase in exposure to loss.
9) Limits for primary policies may differ from those shown when Umbrella or Excess Liability insurance is provided.
10) Contractor shall be responsible for payment of all deductibles.
11) At any time during the Contract Term or any extensions thereof, prior to any lapse in the Certificate of Insurance, the Contractor shall provide to the District an updated certificate.

4.10. ***Right to Audit*** The District will have the right to audit the Contractor's books and records pertaining to all goods and services, and Contractor’s compliance with the terms of the Contract, during the hours of the normal workday during the term of the Contract and for a period of five (5) years following expiration of the Contract.

FBISD
INSPIRE • EQUIP • IMAGINE

DEVIATION REQUEST FORM

Instructions to Bidders: No deviations are allowed in the Base Bid or Base Bid Adjustment. Deviations shall be submitted on the Deviations Form as Alternate 2. *Complete this form, attach any supporting data and submit with Package B.*

Project Title and Number:		
Deviation Request No.	Date Submitted:	Specification Section, and/or Drawing No:
Item Description:		

Reason for Deviation: *(If specified product, material or detail cannot be provided, include statement indicating why and provide supporting information.):*
Differences (point-by-point comparative data) between proposed deviation and specified product, material or detail:

Proposed deviation affects other parts of the project : ☐ YES ☐ NO

Explain:

Time Impact due to Deviation: ☐ YES ☐ NO ☐ ADD ☐ DEDUCT Days

Anticipated deviation savings and/or benefit to the District:

$_____

Date:

Printed Name of Authorized Representative:

Signature of Authorized Representative:

A/E Recommendation:

Deviation Request approved to proceed with deviation:

Deviation Request rejected:
Use specified product

Notes: Date:

Additional Information if Applicable

Reason for Deviation: *(If specified product, material or detail cannot be provided, include statement indicating why and provide supporting information.)*

Differences (point-by-point comparative data) between proposed deviation and specified product, material or detail:

SECTION AC
PACKAGE "A" BASE BID PROPOSAL FORM – CSP STIPULATED SUM

CSP No: 26-006AL **BP** 030 - **BP Name:** WILLOWRIDGE HIGH SCHOOL RENOVATIONS

FORT BEND INDEPENDENT SCHOOL DISTRICT

Submitted by: _____

Date: _____ Phone Number: _____

Vendors are required to respond to all requests identified in the Solicitation and indicate their acceptance or objection to the terms of the Solicitation and these General Provsisions must be clearly indicated in Vendor's Solicatiation Response. No-bid is deemed non-responsive by FBISD.

Having examined Proposal and Contract Documents prepared by Fort Bend ISD and Kirksey Architecture dated 9/16/2025 and having examined site conditions, the undersigned proposes to furnish all labor, equipment and materials and perform all work for the completion of the above-named project for the sum indicated below.

I. DESCRIPTION: The scope of work includes the interior renovations to the existing Willowridge High School and new addition of a 10,500 square foot, single-story structure.

Undersigned agrees to complete the work for the lump sum amounts of:

_____Dollars
(Amount written in words governs)

$_____
(Amount in figures)

II. PROJECT TIMELINES

The District anticipates that this project will take 729 calendar days to complete. Contractor agrees the work will be substantially completed within 729 calendar days from executed contract and issuance of Notice to Proceed.

Should the Contractor anticipate **lower** calendar days to complete this project, please indicate below. The District will consider contractor proposed lower calendar days and incorporate into contract if deemed appropriate.

CONTRACTOR'S PROPOSED DAYS TO COMPLETE BP 030_____

III. LIQUIDATED DAMAGES:

The undersigned understands that liquidated damages as defined in the Supplementary Conditions will be included in the form of Agreement Between Owner and Contractor and that the contractor will be bound thereto.

Contractor accepts the provisions of the Contract as to liquidated damages in the event of failure to complete the work on time. Liquidated damages shall be the sum of **$1,000.00** per day for each calendar day that Substantial Completion is delayed for each project.

Further, the Contractor acknowledges that additional liquidated damages in the sum of **$250.00** per day for each calendar day shall be imposed for non-completion of punch list items and contract close-out within sixty (60) calendar days after Substantial Completion.

IV. ALLOWANCES:

Allowances are to be included in the Contractor's base bid for each project in the following amounts:

A. $TBD . Add description of allowance
B. $Click or tap here to enter text. . Add description of allowance

Contractor should include allowance and markup in the base bid. Section 3.8 of the Supplementary Conditions defines the procedures for markups.

V. UNIT PRICES – BASE BID

UNIT PRICES – FOUNDATION

A. Provide unit pricing for straight shaft drilled piers in lieu of drilled bell bottom piers –same depth as indicated on the Drawings:

01	☐24" Diameter	_____	Each (EA)
02	☐30" Diameter	_____	Each (EA)
03	☐36" Diameter	_____	Each (EA)
04	☐42" Diameter	_____	Each (EA)
05	☐48" Diameter	_____	Each (EA)
06	☐54" Diameter	_____	Each (EA)
07	☐60" Diameter	_____	Each (EA)
08	☐66" Diameter	_____	Each (EA)
09	☐72" Diameter	_____	Each (EA)
10	☐ add diameter Diameter	_____	Each (EA)
11	☐ add diameter Diameter	_____	Each (EA)
12	☐ add diameter Diameter	_____	Each (EA)
13	☐ add diameter Diameter	_____	Each (EA)
14	☐ add diameter Diameter	_____	Each (EA)

B. Provide unit pricing for auger cast piling:

01	☐14” Diameter	_____ Lin. Foot (LF)
02	☐16” Diameter	_____ Lin. Foot (LF)
03	☐18” Diameter	_____ Lin. Foot (LF)
04	☐20” Diameter	_____ Lin. Foot (LF)
05	☐24” Diameter	_____ Lin. Foot (LF)
06	☐ add diameter Diameter	_____ Lin. Foot (LF)
07	☐ add diameter Diameter	_____ Lin. Foot (LF)
08	☐ add diameter Diameter	_____ Lin. Foot (LF)
09	☐ add diameter Diameter	_____ Lin. Foot (LF)
10	☐ add diameter Diameter	_____ Lin. Foot (LF)

UNIT PRICES – SITE CONCRETE

A. Provide unit pricing for the following site concrete work:

01	☐ Add/Delete 60” Wide Sidewalks	_____Lin. Foot (LF)
02	☐ Add/Delete Non-Traffic Concrete Flatwork	_____ Sq. Foot (SF)
03	☐ Add/Delete Med. Duty (5”) Concrete Paving	_____ Sq. Foot (SF)
04	☐ Add/Delete Heavy Duty (7”) Concrete Paving	_____ Sq. Foot (SF)
05	☐ Add/Delete 6” Concrete Curb	_____Lin. Foot (LF)

UNIT PRICES – ELECTRICAL POWER

B. Provide unit pricing for the following electrical power work:

01	☐Add/Delete Contractor generated power to the site/project (in the absence of CenterPoint power availability).	_____ Per Month

UNIT PRICES – ELECTRICAL POWER

A. Provide unit pricing for the following electrical work:

01	☐ Add/Delete 120V Duplex Rec. On Nearby Circuit	_____ Each (EA)
02	☐ Add/Delete 120V Duplex Rec. On Dedicated Circuit, including 20 amp circuit breaker	_____ Each (EA)
03	☐ Add/Delete 220V Rec. On Dedicated Circuit including 20 amp circuit breaker	_____ Each (EA)
04	☐ Add/Delete Two-Way Light Switch	_____ Each (EA)
05	☐ Add/Delete Two-Way Light Switch	_____ Each (EA)
06	☐ Add/Delete J-Box with 1-1/4” Conduit stubbed to above ceiling	_____ Each (EA)

UNIT PRICES – DATA

A. Provide unit pricing for the following electrical work:

01	☐Add/Delete Data Port Wired to Nearest IDF/MDF	_____Each (EA)

VI. CHANGES IN THE WORK

The undersigned understands that changes in the work shall be performed in accordance with the Supplementary Conditions.

VII. PROPOSAL EVALUATION WAIVER

By submitting a Proposal, the proposer indicated below agrees to waive any claim it has or may have against the Owner, Architect, Engineers, Consultants and their respective employees, arising out of or in connection with the administration, evaluation, or recommendation of any proposal. The proposer further agrees the Owner reserves the right to waive any requirements under the proposal documents or the Contract Documents, acceptance or rejection of any proposals, and recommendation or award of the contract.

It is understood that the right is reserved by the Owner to reject any or all proposals, or waive any informalities in Receipt of Proposals.

The undersigned certifies that the amounts contained in this Competitive Sealed Proposal have been carefully checked and are submitted as correct and final; and additionally, agrees to comply with all provisions of the Proposal Form.

The undersigned CONTRACTOR proposes and agrees, if this Proposal is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Proposal and in accordance with the Contract Documents.

CONTRACTOR accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Proposal Security. This Proposal will remain open for sixty (60) days after the day of Proposal opening. CONTRACTOR will sign the Agreement and submit the Contract Security and other documents required by the Contract documents within ten (10) calendar days after the date of the OWNER'S Notice of Award.

In submitting this Proposal, CONTRACTOR represents, as more fully set forth in the Agreement, that:

(a) Contractor has examined copies of all the Contract Documents and of the following addenda, receipt of which is hereby acknowledged, and also copies of the Advertisement or Invitation to Submit Proposal.

_____ **ADD-01** dated _____ Total # pgs_____ **ADD-02** dated _____ Total # pgs_____
_____ **ADD-03** dated _____ Total # pgs_____ **ADD-04** dated _____ Total # pgs_____
_____ **ADD-05** dated _____ Total # pgs_____ **ADD-06** dated _____ Total # pgs_____
_____ **ADD-07** dated _____ Total # pgs_____ **ADD-08** dated _____ Total # pgs_____

(b) CONTRACTOR has examined the site and locality where the work is to be performed, the legal requirements (federal, state and local laws, ordinances, rules and regulations) and the conditions effecting cost, progress or performance of the work and has made such independent investigations as CONTRACTOR deems necessary.

(c) This PROPOSAL is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; CONTRACTOR has not directly or indirectly induced or solicited any other Contractor to submit a false or sham Proposal; CONTRACTOR has not solicited or induced any person, firm or a corporation to refrain from submitting a proposal; and CONTRACTOR has not sought by collusion to obtain for himself any advantage over any other Contractor or over OWNER.

Type of Proposer's Organization:

_____
(Corporation, Co-Partnership, Individual, etc.)

Proposer: _____
(Print or Type)

_____
Signature of Proposer

Title of Office: _____
(Print or Type)

Legal Address: _____
(Print or Type)

_____

Zip Code: _____ Tel:(_____) _____
(Print or Type)

ATTEST:

_____
(Secretary, if Proposer is a Corporation

SEAL:
(If Corporation)

SECTION AC
PACKAGE "B" ALTERNATE BID PROPOSAL FORM – CSP STIPULATED SUM

CSP No: 26-006AL **BP**030 - **BP Name:** WILLOWRIDGE HIGH SCHOOL RENOVATIONS

FORT BEND INDEPENDENT SCHOOL DISTRICT

Submitted by: _____

Date: _____ Phone Number: _____

Vendors are required to respond to all requests identified in the Solicitation and indicate their acceptance or objection to the terms of the Solicitation and these General Provisions must be clearly indicated in Vendor's Solicitation Response. No-bid is deemed non-responsive by FBISD.

Having examined Proposal and Contract Documents prepared by Fort Bend ISD and Kirksey Architecture dated 09/16/2025 and having examined site conditions, the undersigned proposes to furnish all labor, equipment and materials and perform all work for the completion of the above-named project for the sum indicated below.

DESCRIPTION: The scope of work includes the interior renovations to the existing Willowridge High School and new addition of a 10,500 square foot, single-story structure.

Undersigned agrees to complete the work for the lump sum amounts of:

_____Dollars
(Amount written in words governs)

$_____
(Amount in figures)

I. PROJECT TIMELINES – Refer to Section V. for the construction calendar days associated with alternates.

The District anticipates that this project will take 729 calendar days to complete. Contractor agrees the work will be substantially completed within 729 calendar days from executed contract and issuance of Notice to Proceed.

Should the Contractor anticipate **lower** calendar days to complete this project, please indicate below. The District will consider contractor proposed lower calendar days and incorporate into contract if deemed appropriate.

CONTRACTOR'S PROPOSED DAYS TO COMPLETE
BP 030 _____ Base Proposal

BP 030 _____ Alternates
BP 030 _____ Base Proposal and Alternates

(Enter only if LOWER than District's proposed time)

II. LIQUIDATED DAMAGES:

The undersigned understands that liquidated damages as defined in the Supplementary Conditions will be included in the form of Agreement Between Owner and Contractor and that the contractor will be bound thereto.

Contractor accepts the provisions of the Contract as to liquidated damages in the event of failure to complete the work on time. Liquidated damages shall be the sum of **$1,000.00** per day for each calendar day that Substantial Completion is delayed for each project.

Further, the Contractor acknowledges that additional liquidated damages in the sum of **$250.00** per day for each calendar day shall be imposed for non-completion of punch list items and contract close-out within sixty (60) calendar days after Substantial Completion.

III. ALLOWANCES:

Allowances are to be included in the Contractor's base bid for each project in the following amounts:

A. TBD - Owner's Contingency.

Contractor should include allowance and markup in the base bid. Section 3.8 of the Supplementary Conditions defines the procedures for markups.

IV. ALTERNATES

Refer to Division 01 23 00 for administrative and procedural requirements of Alternates.

Alternate No. 1 Base Bid Adjustment

The undersigned agrees to complete <u>all base bid work</u> and adjust the final base bid lump sum amount as follows:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____Dollars
   (Amount written in words governs)

   $_____
   Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:

   _____

Alternate No. 2 Deviations Request Form

If Bidder proposes to use any substitution or deviations from the base bid use Alternate No. 2 via the Deviations Form in section 00 21 13 Instructions to Bidders. If the owner elects to proceed with Alternate No. 2, the undersigned agrees to complete the ADDITIVE work for the lump sum amount of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____Dollars
   (Amount written in words governs)

   $_____
   Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:

   _____

Alternate No. 3A- Water Cooled Chillers (CH-1 & CH-2) - JCI

If the owner elects to proceed with Alternate No. 3A the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____Dollars
   (Amount written in words governs)

   $_____
   Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:

   _____

Alternate No. 3B - Water Cooled Chillers (CH-1 & CH-2) - Daikin.
If the owner elects to proceed with Alternate No. 3B the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
   (Amount written in words governs)

   $ _____
   Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:

   _____

Alternate No. 4A - Air Cooled Chiller (ACCH - 4) - Carrier.
If the owner elects to proceed with Alternate No. 4A the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
   (Amount written in words governs)

   $ _____
   Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:

   _____

Alternate No. 4B - Air Cooled Chiller (ACCH - 4) - JCI
If the owner elects to proceed with Alternate No. 4B the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
(Amount written in words governs)
$ _____
Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:
_____

Alternate No. 4C - Air Cooled Chiller (ACCH - 4) - Daikin
If the owner elects to proceed with Alternate No. 4C the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
(Amount written in words governs)
$ _____
Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:
_____

Alternate No. 5A -Air Cooled Chillers at Auditorium (ACCH-3ALT and ACCH-4ALT) - Carrier.
If the owner elects to proceed with Alternate No. 5A the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
(Amount written in words governs)
$ _____
Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:
_____

Alternate No. 5B -Air Cooled Chillers at Auditorium (ACCH-3ALT and ACCH-4ALT) - JCI.
If the owner elects to proceed with Alternate No. 5B the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
(Amount written in words governs)
$ _____
Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:
_____

Alternate No. 5C - Air Cooled Chillers at Auditorium (ACCH-3ALT and ACCH-4ALT) - Daikin
If the owner elects to proceed with Alternate No. 5C the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
(Amount written in words governs)

$ _____
Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:
_____

Alternate No. 6 - Walkway Lighting in Auditorium.
If the owner elects to proceed with Alternate No. 6 the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
(Amount written in words governs)

$ _____
Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:
_____

Alternate No. 7 - New Cloud Ceiling in Auditorium.
If the owner elects to proceed with Alternate No. 7 the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
(Amount written in words governs)

$ _____
Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:
_____

Alternate No. 8 - Updated Theater Lobby Finishes.
If the owner elects to proceed with Alternate No. 8 the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
(Amount written in words governs)

$ _____
Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:
_____

Alternate No. 9A - Elevator #2 Replacement.
If the owner elects to proceed with Alternate No. 9A the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
(Amount written in words governs)

$ _____
Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:
_____

Alternate No. 9B - Elevator #2 Modernization.
If the owner elects to proceed with Alternate No. 9B the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
(Amount written in words governs)

$ _____
Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:
_____

Alternate No. 10 - Air Handling Unit at Field House
If the owner elects to proceed with Alternate No. 10 the undersigned agrees to complete the ADDITIVE work for the lump sum amounts of:

1. Add ☐ Deduct ☐ No Change ☐ Not Applicable ☐
2. _____ Dollars
(Amount written in words governs)

$ _____
Amount written in figures
3. Add ☐ Deduct ☐ No. of calendar days to adjust the Contract Time for this alternate:
_____

V. UNIT PRICES – ALTERNATE BID

UNIT PRICES – Add Description

01	☐ add description	_____	add unit
02	☐ add description	_____	add unit
03	☐ add description	_____	add unit
04	☐ add description	_____	add unit
05	☐ add description	_____	add unit

VI. CHANGES IN THE WORK

The undersigned understands that changes in the work shall be performed in accordance with the Supplementary Conditions.

VII. PROPOSAL EVALUATION WAIVER

By submitting a Proposal, the proposer indicated below agrees to waive any claim it has or may have against the Owner, Architect, Engineers, Consultants and their respective employees, arising out of or in connection with the administration, evaluation, or recommendation of any proposal. The proposer further agrees the Owner reserves the right to waive any requirements under the proposal documents or the Contract Documents, acceptance or rejection of any proposals, and recommendation or award of the contract.

It is understood that the right is reserved by the Owner to reject any or all proposals, or waive any informalities in Receipt of Proposals.

The undersigned certifies that the amounts contained in this Competitive Sealed Proposal have been carefully checked and are submitted as correct and final; and additionally, agrees to comply with all provisions of the Proposal Form.

The undersigned CONTRACTOR proposes and agrees, if this Proposal is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Proposal and in accordance with the Contract Documents.

CONTRACTOR accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Proposal Security. This Proposal will remain open for sixty (60) days after the day of Proposal opening. CONTRACTOR will sign the Agreement and submit the Contract Security and other documents required by the Contract documents within ten (10) calendar days after the date of the OWNER'S Notice of Award.

In submitting this Proposal, CONTRACTOR represents, as more fully set forth in the Agreement, that:

(a) Contractor has examined copies of all the Contract Documents and of the following addenda, receipt of which is hereby acknowledged, and also copies of the Advertisement or Invitation to Submit Proposal.

_____ **ADD-01** dated _____ Total # pgs_____ **ADD-02** dated _____ Total # pgs_____

_____ **ADD-03** dated _____ Total # pgs_____ **ADD-04** dated _____ Total # pgs_____

_____ **ADD-05** dated _____ Total # pgs_____ **ADD-06** dated _____ Total # pgs_____

_____ **ADD-07** dated _____ Total # pgs_____ **ADD-08** dated _____ Total # pgs_____

(b) CONTRACTOR has examined the site and locality where the work is to be performed, the legal requirements (federal, state and local laws, ordinances, rules and regulations) and the conditions effecting cost, progress or performance of the work and has made such independent investigations as CONTRACTOR deems necessary.

(c) This PROPOSAL is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; CONTRACTOR has not directly or indirectly induced or solicited any other Contractor to submit a false or sham Proposal; CONTRACTOR has not solicited or induced any person, firm or a corporation to refrain from submitting a proposal; and CONTRACTOR has not sought by collusion to obtain for himself any advantage over any other Contractor or over OWNER.

Type of Proposer's Organization:

_____

(Corporation, Co-Partnership, Individual, etc.)

Proposer: _____

(Print or Type)

_____

Signature of Proposer

Title of Office: _____

(Print or Type)

Legal Address: _____

(Print or Type)

_____

Zip Code: _____ Tel:(_____) _____

(Print or Type)

ATTEST:

_____

(Secretary, if Proposer is a Corporation

RETURN THIS DOCUMENT IN CSP BID/PROPOSAL PACKAGE

SEAL:
(If Corporation)

AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor *where the basis of payment is a Stipulated Sum*

AGREEMENT made as of the day of in the year
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Fort Bend Independent School District
16431 Lexington Boulevard
Sugar Land, Texas 77479

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

The Architect:
(Name, legal status, address and other information)

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

Init.
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TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[X] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

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[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[X] By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)
Attached as Exhibit E		

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

$1,000.00 per calendar day that substantial completion is delayed.
$250.00 per day for each calendar day for non-completion of punch list items and contract close-out within 60 days after substantial completion

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

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ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the 25th day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the 22nd day of the following month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than Thirty One (31) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Five Percent (5%)

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§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

At the Owner's sole discretion

(Paragraphs deleted)
§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment
§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest
Payments due and unpaid under the Contract shall bear interest in accordance with Chapter 2251 of the Texas Government Code, except when disputed in accordance with Chapter 2251 of the Texas Government Code.
(Insert rate of interest agreed upon, if any.)

%

ARTICLE 6 DISPUTE RESOLUTION
§ 6.1 Initial Decision Maker
The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

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§ 6.2 Binding Dispute Resolution
For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[X] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION
§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS
§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

Carolina Fuzetti, MS, PMP
Executive Director, Design & Construction
Fort Bend Independent School District
2323 Texas Parkway
Missouri City, TX 77489
281 634-5592

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

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§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 Attached as Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, as amended by the Owner.

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date
Attached as Exhibit D		

.6 Specifications

Section	Title	Date	Pages
Attached as Exhibit C			

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

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[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

Exhibit A: Insurance and Bonds
B: CSP Negotiated Items
C: Specifications Table of Contents
D: List of Drawings
E: Unit Prices
F: Warranty Letter

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
Dr. Christie Whitbeck, Superintendent Fort Bend Independent School District	.
(Printed name and title)	*(Printed name and title)*

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Additions and Deletions Report for

AIA® Document A101® – 2017

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

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PAGE 1

Fort Bend Independent School District
16431 Lexington Boulevard
Sugar Land, Texas 77479

PAGE 2

[X] A date set forth in a notice to proceed issued by the Owner.

PAGE 3

[X] By the following date:

...

Attached as Exhibit E

...

$1,000.00 per calendar day that substantial completion is delayed.
$250.00 per day for each calendar day for non-completion of punch list items and contract close-out within 60 days after substantial completion

PAGE 4

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the 25th day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the 22nd day of the following month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than Thirty One (31) days after the Architect receives the Application for Payment.

...

Five Percent (5%)

PAGE 5

At the Owner's sole discretion

~~**§ 5.1.7.3** Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:~~
~~*(Insert any other conditions for release of retainage upon Substantial Completion.)*~~

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...

Payments due and unpaid under the Contract shall bear interest ~~from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.~~in accordance with Chapter 2251 of the Texas Government Code, except when disputed in accordance with Chapter 2251 of the Texas Government Code.

PAGE 6

[**X**] Litigation in a court of competent jurisdiction

...

Carolina Fuzetti, MS, PMP
Executive Director, Design & Construction
Fort Bend Independent School District
2323 Texas Parkway
Missouri City, TX 77489
281 634-5592

PAGE 7

.2 ~~AIA Document A101™–2017,~~ Attached as Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for ~~Construction~~Construction, as amended by the Owner.

...

Attached as Exhibit D

...

Attached as Exhibit C

PAGE 8

Exhibit A: Insurance and Bonds
B: CSP Negotiated Items
C: Specifications Table of Contents
D: List of Drawings
E: Unit Prices
F: Warranty Letter

...

Dr. Christie Whitbeck, Superintendent
Fort Bend Independent School District .

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Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, , hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 16:50:02 ET on 03/31/2022 under Order No. 2114291871 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A101™ – 2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

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AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

Fort Bend Independent School District
16431 Lexington Boulevard
Sugar Land, Texas 77479

THE ARCHITECT:
(Name, legal status and address)

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

TABLE OF ARTICLES

1 GENERAL PROVISIONS
2 OWNER
3 CONTRACTOR
4 ARCHITECT
5 SUBCONTRACTORS
6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
7 CHANGES IN THE WORK
8 TIME
9 PAYMENTS AND COMPLETION
10 PROTECTION OF PERSONS AND PROPERTY
11 INSURANCE AND BONDS
12 UNCOVERING AND CORRECTION OF WORK
13 MISCELLANEOUS PROVISIONS

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14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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INDEX
(Topics and numbers in bold are Section headings.)

Acceptance of Nonconforming Work
9.6.6, 9.9.3, **12.3**
Acceptance of Work
9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3
Access to Work
3.16, 6.2.1, 12.1
Accident Prevention
10
Acts and Omissions
3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.3.2, 14.1, 15.1.2, 15.2
Addenda
1.1.1
Additional Costs, Claims for
3.7.4, 3.7.5, 10.3.2, 15.1.5
Additional Inspections and Testing
9.4.2, 9.8.3, 12.2.1, **13.4**
Additional Time, Claims for
3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**
Administration of the Contract
3.1.3, **4.2**, 9.4, 9.5
Advertisement or Invitation to Bid
1.1.1
Aesthetic Effect
4.2.13
Allowances
3.8
Applications for Payment
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10
Approvals
2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10.1, 4.2.7, 9.3.2, 13.4.1
Arbitration
8.3.1, 15.3.2, **15.4**
ARCHITECT
4
Architect, Definition of
4.1.1
Architect, Extent of Authority
2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1
Architect, Limitations of Authority and Responsibility
2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2, 9.5.4, 9.6.4, 15.1.4, 15.2
Architect's Additional Services and Expenses
2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4
Architect's Administration of the Contract
3.1.3, 3.7.4, 15.2, 9.4.1, 9.5
Architect's Approvals
2.5, 3.1.3, 3.5, 3.10.2, 4.2.7
Architect's Authority to Reject Work
3.5, 4.2.6, 12.1.2, 12.2.1
Architect's Copyright
1.1.7, 1.5
Architect's Decisions
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.4.2, 15.2
Architect's Inspections
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4
Architect's Instructions
3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2
Architect's Interpretations
4.2.11, 4.2.12
Architect's Project Representative
4.2.10
Architect's Relationship with Contractor
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2
Architect's Relationship with Subcontractors
1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3
Architect's Representations
9.4.2, 9.5.1, 9.10.1
Architect's Site Visits
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Asbestos
10.3.1
Attorneys' Fees
3.18.1, 9.6.8, 9.10.2, 10.3.3
Award of Separate Contracts
6.1.1, 6.1.2
Award of Subcontracts and Other Contracts for Portions of the Work
5.2
Basic Definitions
1.1
Bidding Requirements
1.1.1
Binding Dispute Resolution
8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1
Bonds, Lien
7.3.4.4, 9.6.8, 9.10.2, 9.10.3
Bonds, Performance, and Payment
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**
Building Information Models Use and Reliance
1.8
Building Permit
3.7.1
Capitalization
1.3
Certificate of Substantial Completion
9.8.3, 9.8.4, 9.8.5

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Certificates for Payment
4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4
Certificates of Inspection, Testing or Approval
13.4.4
Certificates of Insurance
9.10.2
Change Orders
1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.5
Claims, Definition of
15.1.1
Claims, Notice of
1.6.2, 15.1.3
CLAIMS AND DISPUTES
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4
Claims and Timely Assertion of Claims
15.4.1
Claims for Additional Cost
3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**
Claims for Additional Time
3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3, 11.3.2, 14.2.4, 15.1.7
Claims Subject to Arbitration
15.4.1
Cleaning Up
3.15, 6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, **15.1.5**
Commencement of the Work, Definition of
8.1.2
Communications
3.9.1, **4.2.4**
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 14.1.2, 15.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 15.1.2
Compliance with Laws
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2, 15.4.4.2
Consolidation or Joinder
15.4.4
CONSTRUCTION BY OWNER OR BY
SEPARATE CONTRACTORS
1.1.4, **6**
Construction Change Directive, Definition of
7.3.1
Construction Change Directives
1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1
Construction Schedules, Contractor's
3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.4
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR
SUSPENSION OF THE
5.4.1.1, 5.4.2, 11.5, **14**
Contract Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating to
3.7.1, 3.10, 5.2, 6.1
Contract Documents, Copies Furnished and Use of
1.5.2, 2.3.6, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5, 15.2.5**
Contract Sum, Definition of
9.1
Contract Time
1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5, 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, 6.1.2
Contractor's Construction and Submittal Schedules
3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2

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Contractor's Employees
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.3, 14.1, 14.2.1.1
Contractor's Liability Insurance
11.1
Contractor's Relationship with Separate Contractors and Owner's Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4
Contractor's Relationship with Subcontractors
1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7, 9.10.2, 11.2, 11.3, 11.4
Contractor's Relationship with the Architect
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.4, 15.1.3, 15.2.1
Contractor's Representations
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2
Contractor's Responsibility for Those Performing the Work
3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8
Contractor's Review of Contract Documents
3.2
Contractor's Right to Stop the Work
2.2.2, 9.7
Contractor's Right to Terminate the Contract
14.1
Contractor's Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3
Contractor's Superintendent
3.9, 10.2.6
Contractor's Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4
Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1
Copies Furnished of Drawings and Specifications
1.5, 2.3.6, 3.11
Copyrights
1.5, **3.17**
Correction of Work
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3, 15.1.3.1, 15.1.3.2, 15.2.1
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.4
Costs
2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 14
Cutting and Patching
3.14, 6.2.5
Damage to Construction of Owner or Separate Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damages, Claims for
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2, 11.3, 14.2.4, 15.1.7
Damages for Delay
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2
Date of Commencement of the Work, Definition of
8.1.2
Date of Substantial Completion, Definition of
8.1.3
Day, Definition of
8.1.4
Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2, 14.2.2, 14.2.4, 15.1, 15.2
Decisions to Withhold Certification
9.4.1, **9.5**, 9.7, 14.1.1.3
Defective or Nonconforming Work, Acceptance, Rejection and Correction of
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1
Definitions
1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1
Delays and Extensions of Time
3.2, **3.7.4**, 5.2.3, 7.2.1, 7.3.1, **7.4**, **8.3**, 9.5.1, **9.7**, 10.3.2, **10.4**, 14.3.2, **15.1.6**, 15.2.5
Digital Data Use and Transmission
1.7
Disputes
6.3, 7.3.9, 15.1, 15.2
Documents and Samples at the Site
3.11
Drawings, Definition of
1.1.5
Drawings and Specifications, Use and Ownership of
3.11
Effective Date of Insurance
8.2.2
Emergencies
10.4, 14.1.1.2, **15.1.5**
Employees, Contractor's
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.3, 14.1, 14.2.1.1
Equipment, Labor, or Materials
1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4

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Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.6, **15.2.5**
Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Faulty Work
(See Defective or Nonconforming Work)
Final Completion and Final Payment
4.2.1, 4.2.9, 9.8.2, **9.10**, 12.3, 14.2.4, 14.4.3
Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4
GENERAL PROVISIONS
1
Governing Law
13.1
Guarantees (See Warranty)
Hazardous Materials and Substances
10.2.4, **10.3**
Identification of Subcontractors and Suppliers
5.2.1
Indemnification
3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3
Information and Services Required of the Owner
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Initial Decision
15.2
Initial Decision Maker, Definition of
1.1.8
Initial Decision Maker, Decisions
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Initial Decision Maker, Extent of Authority
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Injury or Damage to Person or Property
10.2.8, 10.4
Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.4
Instructions to Bidders
1.1.1
Instructions to the Contractor
3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2
Instruments of Service, Definition of
1.1.7
Insurance
6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5, **11**
Insurance, Notice of Cancellation or Expiration
11.1.4, 11.2.3
Insurance, Contractor's Liability
11.1
Insurance, Effective Date of
8.2.2, 14.4.2
Insurance, Owner's Liability
11.2
Insurance, Property
10.2.5, 11.2, 11.4, 11.5
Insurance, Stored Materials
9.3.2
INSURANCE AND BONDS
11
Insurance Companies, Consent to Partial Occupancy
9.9.1
Insured loss, Adjustment and Settlement of
11.5
Intent of the Contract Documents
1.2.1, 4.2.7, 4.2.12, 4.2.13
Interest
13.5
Interpretation
1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written
4.2.11, 4.2.12
Judgment on Final Award
15.4.2
Labor and Materials, Equipment
1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Labor Disputes
8.3.1
Laws and Regulations
1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Liens
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Limitations, Statutes of
12.2.5, 15.1.2, 15.4.1.1
Limitations of Liability
3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6, 4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3, 11.3, 12.2.5, 13.3.1
Limitations of Time
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15, 15.1.2, 15.1.3, 15.1.5
Materials, Hazardous
10.2.4, **10.3**
Materials, Labor, Equipment and
1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2
Means, Methods, Techniques, Sequences and Procedures of Construction
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2
Mechanic's Lien
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Mediation
8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1, 15.4.1.1
Minor Changes in the Work
1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, **7.4**

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MISCELLANEOUS PROVISIONS
13
Modifications, Definition of
1.1.1
Modifications to the Contract
1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2
Mutual Responsibility
6.2
Nonconforming Work, Acceptance of
9.6.6, 9.9.3, **12.3**
Nonconforming Work, Rejection and Correction of
2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2
Notice
1.6, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4, 3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4, 8.2.2 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1, 13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5, 15.1.6, 15.4.1
Notice of Cancellation or Expiration of Insurance
11.1.4, 11.2.3
Notice of Claims
1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5, 15.1.6, 15.2.8, 15.3.2, 15.4.1
Notice of Testing and Inspections
13.4.1, 13.4.2
Observations, Contractor's
3.2, 3.7.4
Occupancy
2.3.1, 9.6.6, 9.8
Orders, Written
1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2, 14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Evidence of Financial Arrangements
2.2, 13.2.2, 14.1.1.4
Owner, Information and Services Required of the
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Owner's Authority
1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4, 15.2.7
Owner's Insurance
11.2
Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2
Owner's Right to Carry Out the Work
2.5, 14.2.2
Owner's Right to Clean Up
6.3
Owner's Right to Perform Construction and to Award Separate Contracts
6.1
Owner's Right to Stop the Work
2.4
Owner's Right to Suspend the Work
14.3
Owner's Right to Terminate the Contract
14.2, 14.4
Ownership and Use of Drawings, Specifications and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12, 5.3
Partial Occupancy or Use
9.6.6, **9.9**
Patching, Cutting and
3.14, 6.2.5
Patents
3.17
Payment, Applications for
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3
Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3
Payment Bond, Performance Bond and
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
PAYMENTS AND COMPLETION
9
Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2
PCB
10.3.1
Performance Bond and Payment Bond
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Permits, Fees, Notices and Compliance with Laws
2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2
PERSONS AND PROPERTY, PROTECTION OF
10
Polychlorinated Biphenyl
10.3.1
Product Data, Definition of
3.12.2
Product Data and Samples, Shop Drawings
3.11, **3.12**, 4.2.7
Progress and Completion
4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.4
Progress Payments
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

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Project, Definition of
1.1.4
Project Representatives
4.2.10
Property Insurance
10.2.5, **11.2**
Proposal Requirements
1.1.1
PROTECTION OF PERSONS AND PROPERTY
10
Regulations and Laws
1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Rejection of Work
4.2.6, 12.2.1
Releases and Waivers of Liens
9.3.1, 9.10.2
Representations
3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10
Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
Review of Contract Documents and Field Conditions by Contractor
3.2, 3.12.7, 6.1.3
Review of Contractor's Submittals by Owner and Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2
Review of Shop Drawings, Product Data and Samples by Contractor
3.12
Rights and Remedies
1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2, 12.2.4, **13.3**, 14, 15.4
Royalties, Patents and Copyrights
3.17
Rules and Notices for Arbitration
15.4.1
Safety of Persons and Property
10.2, 10.4
Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3, **10.1**, 10.2, 10.4
Samples, Definition of
3.12.3
Samples, Shop Drawings, Product Data and
3.11, **3.12**, 4.2.7
Samples at the Site, Documents and
3.11
Schedule of Values
9.2, 9.3.1
Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2
Separate Contractors, Definition of
6.1.1
Shop Drawings, Definition of
3.12.1
Shop Drawings, Product Data and Samples
3.11, **3.12**, 4.2.7
Site, Use of
3.13, 6.1.1, 6.2.1
Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4
Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Special Inspections and Testing
4.2.6, 12.2.1, 13.4
Specifications, Definition of
1.1.6
Specifications
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14
Statute of Limitations
15.1.2, 15.4.1.1
Stopping the Work
2.2.2, 2.4, 9.7, 10.3, 14.1
Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4
Subcontractor, Definition of
5.1.1
SUBCONTRACTORS
5
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7
Subcontractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1
Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, **11.3**
Substances, Hazardous
10.3
Substantial Completion
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 15.1.2
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
2.3.3
Substitutions of Materials
3.4.2, 3.5, 7.3.8
Sub-subcontractor, Definition of
5.1.2

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Subsurface Conditions
3.7.4
Successors and Assigns
13.2
Superintendent
3.9, 10.2.6
Supervision and Construction Procedures
1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4
Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6, 9.10.5, 14.2.1
Surety
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2, 15.2.7
Surety, Consent of
9.8.5, 9.10.2, 9.10.3
Surveys
1.1.7, 2.3.4
Suspension by the Owner for Convenience
14.3
Suspension of the Work
3.7.5, 5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
Taxes
3.6, 3.8.2.1, 7.3.4.4
Termination by the Contractor
14.1, 15.1.7
Termination by the Owner for Cause
5.4.1.1, **14.2,** 15.1.7
Termination by the Owner for Convenience
14.4
Termination of the Architect
2.3.3
Termination of the Contractor Employment
14.2.2

TERMINATION OR SUSPENSION OF THE CONTRACT
14
Tests and Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 12.2.1, **13.4**
TIME
8
Time, Delays and Extensions of
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5
Time Limits
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15.1.2, 15.1.3, 15.4
Time Limits on Claims
3.7.4, 10.2.8, 15.1.2, 15.1.3
Title to Work
9.3.2, 9.3.3
UNCOVERING AND CORRECTION OF WORK
12
Uncovering of Work
12.1
Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3
Unit Prices
7.3.3.2, 9.1.2
Use of Documents
1.1.1, 1.5, 2.3.6, 3.12.6, 5.3
Use of Site
3.13, 6.1.1, 6.2.1
Values, Schedule of
9.2, 9.3.1
Waiver of Claims by the Architect
13.3.2
Waiver of Claims by the Contractor
9.10.5, 13.3.2, **15.1.7**
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, **15.1.7**
Waiver of Consequential Damages
14.2.4, 15.1.7
Waiver of Liens
9.3, 9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, **11.3**
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2, 15.1.2
Weather Delays
8.3, 15.1.6.2
Work, Definition of
1.1.3
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3, 13.2, 13.3.2, 15.4.4.2
Written Interpretations
4.2.11, 4.2.12
Written Orders
1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Performance Bond, Labor and Material Payment Bond, Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to propose, instructions to Proposers, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's Proposal or portions of Addenda relating to proposal requirements).

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project. It also includes all supplies, skill, supervision, transportation services and other facilities and things necessary, proper or incidental to the carrying out and completion of the terms of the contract and all other items of cost or value needed to produce, construct and fully complete the public work identified by the Contract Documents. Nothing in these Conditions shall be interpreted as imposing on either the Owner or the Architect, or their respective agents, employees, officers, directors or consultants, any duty, obligation or authority with respect to any items that are not intended to be incorporated into the completed Project, or that do not comprise the Work, including, without limitation, shoring, scaffolding, hoists, weatherproofing, or any temporary facility or activity, since these are the sole responsibility of the Contractor.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

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§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.1.2 Precedence of the Contract Documents: The most recently issued Document takes precedence over previous issues of the same Document. The order of precedence is as follows with the highest authority listed as "1".

.1 Contract Modifications (such as Change Orders) signed by the Contractor and Owner.
.2 The Agreement. (AIA Document A101-2017)
.
.3 The General Conditions of the Contract for Construction
.4 Addenda, with those of later date having precedence over those of earlier date
.5 Drawings and Specifications

Should these Documents disagree in themselves, the Architect and Owner will select the appropriate method for performing the Work, to facilitating avoiding increase in the Contract cost. If an item is shown one place in the Drawings, but no another, or called for in a schedule or the specifications but not shown on the Drawings, or shown on the Drawings but not in a schedule, it is to be included. Existing conditions take precedence over Drawings and Specifications for dimensions.

§ 1.2.1.3 Relation of Specifications and Drawings: To be equivalent in authority and priority. Should they disagree in themselves, or with each other, prices shall be based on the most expensive combination of quality and quantity of Work indicated. In the event of the above mentioned disagreements, the resolution shall be determined by the Architect and Owner.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 In the case of inconsistency within or between the Drawings and Specifications discovered prior to Proposal Submission Time but too late to be clarified by an Addendum, the better quality or greater quantity of Work shall be included in the Proposal. Clarification of any inconsistency will be accomplished with the Contractor after award of Contract and, if necessary, an appropriate reduction in the Contract will be accomplished by Change Order.

§ 1.2.5 Product and Reference Standards. When specific products, systems or items of equipment are referred to in the Contract Documents, any ancillary devices which the Contractor knows, or in accordance with the standard of care for a Contractor should have known, is necessary for proper functioning shall also be provided. When standards, codes, manufacturer's instructions and guarantees are required and no edition is specified by the Contract Documents, the current edition at the time of Contract execution shall apply whether or not the proper edition was set out in the Contract Documents. References to standards, codes, manufacturer's instructions and guarantees shall apply in full, except:

.1 They do not supersede more stringent standards set out in the Contract Documents, and
.2 any exclusions or waivers that are inconsistent with the Contract Documents do not apply.

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§ 1.2.6 Relations of Specifications and Drawings. General Requirements in the Specifications govern the execution of all Work. Summary paragraphs present a brief indication of the Work, but do not limit the Work as later detailed. Should the Drawings and Specifications have internal inconsistencies, then the Contractor shall base the bids and construction on the most expensive combination of quality and quantity of work indicated. For purposes of construction, the Architect shall determine the appropriate Work, after the Contractor brings the inconsistency to the Architect's attention. Failure to report an inconsistency shall be evidence that Contractor has elected to proceed in the more expensive manner.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer at the corporation for which is was intended, or if delivered at or sent by certified mail, or by registered or certified mail, or by courier service providing proof of delivery, to the last business address known to the party giving notice, or if delivered by facsimile or other electronic communications to the offices of the person or corporation for which it was intended. For facsimiles or other electronic communications received after 5:00 p.m. on a business day, or on a weekend or legal holiday on which the recipient's offices are closed, notice shall be deemed to have been duly served on the next business day.

(Paragraph deleted)

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

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§1.9 Miscellaneous Other Definitions

§1.9.1 Addenda, Addendum. Documents issued by the Architect prior to execution of the Owner Contractor Agreement for this Project that modify or clarify the Proposal Documents. All addenda become a part of the Contract Documents.

§1.9.2 Alternate Proposal(s). A separate amount stated on a separate Proposal Form which, if accepted by the Owner, will be added to or deducted from the Base Proposal. If accepted, the work that corresponds to the alternate proposal will become part of the agreement between Owner and Contractor. Alternate proposals shall remain valid for the same period of time as the Base Proposal after receipt of proposals, regardless if an Owner Contractor Agreement has been executed, unless indicated otherwise herein.

§1.9.3 Approved, Approved Equivalent, Approved Equal, or Equal. The terms Approved, Approved Equivalent, Approved Equal, and Or Equal, relate to the substitution of products or systems approved in writing by the Architect. Refer to Paragraph 3.4.2, Substitution of Products and Systems, for procedures which must be followed after award of contract. The substitution procedure process to be followed prior to receipt of proposals is described in the Instructions to Bidders.

§1.9.4 Base Proposal. The Contractor's proposal for the Work, not including any Alternates.

§1.9.5 Contract Time. The period of time which is established in the Contract Documents for Substantial Completion of the Work. This period of time is subject to authorized adjustments as enumerated in the Contract Documents.

§1.9.6 Date of Agreement. The date the Owner formally awards a Contract for Construction of the Work. This date will be inserted in the first page of the Agreement between Owner and Contractor and shall be referenced in Performance Bond and Payment Bond forms. See also Date of Commencement of Work.

§1.9.7 Date of Commencement of the Work. The date of a written Notice to Proceed to the Contractor for a given portion of the Work. This date constitutes day zero (0) of the stated Contract Time. The Notice to Proceed will be issued after the District has received and validated the Contractor's Payment Bond, Performance Bond and Insurance.

§1.9.8 Date of Final Completion. The end of construction. See AIA Document A201, Section 9.10.

§1.9.9 Day. The following days are referenced in the documents:

.1 **Calendar Days**: The Contract Time is established in Calendar Days and extensions of time granted for Regular Work Days lost, if any, will be converted to Calendar Days.

.2 **Holidays:** The days officially recognized by the construction industry in this area as a holiday; normally limited to the observance days of New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and the day after and Christmas Day.

.3 **Regular Work Days:** All calendar days except holidays, Saturdays, and Sundays. Requests for extensions of time shall be requested on the basis of Regular Work Days, and those days, if approved, will be converted to calendar days by multiplying by a factor of one and four-tenths (1.4).

.4 **No extensions of the Contract Time will be granted due to inclement weather except as stated in Section 8.3.1.**

§ 1.9.10 Final Completion. Achieved after the Work has been completed by the Contractor, the final inspection has been performed by the Architect and the Owner, the Contract Closeout process has been completed, and the final Certificate for Payment has been issued by the Architect to the Owner. See Sections 1.1.14 and 9.10 and Specification sections regarding Contract Close Out.

§1.9.11 Notice to Proceed. A notice that may be given by the Owner to the Contractor that directs the Contractor to start the Work. It may also establish the Date of Commencement of the Work.

§ 1.9.12 The Project Manual. A volume assembled for the Work which may include the Proposal requirements, sample forms, Conditions of the Contract, Drawings and Specifications.

§ 1. 9.13 Proposal. A complete and properly signed proposal to do the Work for the sums stipulated therein, submitted

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on the prescribed forms in accordance with the Proposal Documents.

§ 1.9.14 Proposal Documents. All documents and bound into or referenced in the Project Manual, the Drawings, and Addenda related thereto. The Project Manual contains the Proposal requirements, Contract and other forms, Conditions of the Contract, the Specifications, and a list of Drawings and Schedules, some of which are bound into the Project Manual (other Drawings and Specifications are bound separately).

§ 1.9.15 Proposer. A person or entity who submits a Proposal.

§**1.9.16 Provide.** Whenever the word "provide" is used in these documents, it shall mean the same as "furnish and install".

§**1.9.17 Punch List.** A comprehensive list prepared by the Contractor prior to Substantial Completion to establish all items to be completed or corrected; this list may be supplemented by the Architect or Owner. See AIA Document A201, Section 9.8.

§ 1.9.18 SMALL BUSINESS ENTERPRISE PROGRAM ("SBEP"). Owner has adopted the SBEP to provide increased business opportunities for locally certified small businesses to competitively participate in contracting and procurement within FBISD. *See* FBISD Board Policy CV(Local).

§ 1.9.19 SUB-PROPOSER. A person or entity who submits a Proposal to a Proposer for materials, equipment or labor for a portion of the Work.

§**1.9.20 Unit Prices.** A cost for a unit of work as described in the Contract Documents. The Owner may add or deduct Unit Price work at the amounts stated on the Proposal Form and such amounts shall not be subject to additional mark up by the Contractor or his subcontractors."

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. All parties understand that only the Board of Trustees for the Owner acting as a body corporate has the authority to bind the Owner with respect to all matters requiring the Board's approval under current policy of the Board of Trustees for the Owner, including, but not limited to, Change Orders. Except as otherwise provided in Section 4.2.1, the Architect does not have authority to bind the Owner with respect to matters requiring the Owner's approval or authorization. The term "Owner" means the Owner or the Owner's authorized representative.

(Paragraph deleted)

§ 2.1.2 The Board of Trustees, by majority vote, is the only representative of the Owner, an independent school district, having the power to enter into a contract, to approve a Change Order requiring an increase in the Contract Sum, or agree to an extension to the contractual Completion Date, unless this authority is lawfully delegated. Neither Architect nor Contractor may reply upon the direction of any employee of Owner or Program Manager who has not been designated in writing by the Superintendent of Schools or Board of Trustees of Owner; Owner shall not be financially responsible for actions taken by the Architect or Contractor in reliance upon direction from unauthorized persons.

§ 2.1.3 The presence of the Owner, Program Manager or Architect at the Work site does not imply acceptance or approval of the Work.

§ 2.1.4 The Owner, being a public body under the laws of the State of Texas, must have funds in the full amount of the Contract on hand prior to award and execution of the Contract. Furthermore, no Contract exists between the Owner and the Contractor until the formation of the Contract is approved by a majority of the Board of Trustees of the Owner in open session at a duly held Board meeting, and the contract is signed by an authorized Owner's representative.

§ 2.1.5 At any time prior to the Owner's receipt of the executed Agreement with the required bonds and insurance, the Owner may, at its sole option and without cause, reject the offer described in this Agreement by delivering to the Contractor a written notice stating so. Such notice shall be signed by the Owner's Director of Purchasing or designee, and shall be effective on receipt by the Contractor. The rejection of the offer described in this Agreement, shall cause

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no obligation or duty to the Owner save return of bid or proposal security, if any, if rejection is without cause. This section does not pertain to rejection for cause by the Owner, or for the Contractor's failure to provide require bonds or insurance.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract.

(Paragraphs deleted)

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 The Contractor shall pay the cost of reproduction, postage, and handling of all sets of Drawings and Specifications necessary for the Contractor to execute the Work. If the Contractor requests in writing that the Architect and his Consultants update the original Drawings and Specifications to incorporate Addendum items, or Modifications, the Architect and his Consultants will do so at their expense. However, the Contractor shall pay the cost of reproduction, postage and handling of all sets of Drawings and Specifications necessary for the Contractor to execute the Work.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the work in accordance with the Contract Documents and fails, after

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receipt of written notice from the Owner, to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case, an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the actual cost of correcting such deficiencies, including the Owner's expenses and compensation for the Architect, Program Manager and other consultants' additional services and expenses made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to the prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner within thirty (30) days of receipt of written notice from the Owner therefor.

§ 2.5.1 After the Work is complete the Owner may make emergency repairs to the Work if necessary to prevent further damage, or if the Contractor does not promptly respond to a notice of a condition requiring repairs. Contractor shall be responsible to Owner for this cost if the reason for the repairs is defects in Contractor's Work. If payments then or thereafter due the Contractor are not sufficient to cover such costs, the Contractor shall pay the difference to the Owner

§ 2.7 Owner's Right to Occupy the Project

§ 2.7.1 The Owner shall have the right to occupy or use without prejudice to the right of either party, any completed or largely completed portions of the project, notwithstanding the time for completing the entire work or such portions may not yet have expired. Such occupancy and use shall not constitute acceptance of any work not in accordance with the Contract Documents. If the Contractor determines that said occupancy may cause a delay to the completion of the project, he shall notify the Owner in writing immediately.

§ 2.7.2 Refer to Article 11 Insurance and Bonds regarding property insurance requirements in the event of such occupancy.

§ 2.7.3 If Contractor has not completed the obligations of the Contract Documents by the dates established by subsequent Amendments to the Agreement Between Owner and Construction Manager, the Owner shall have the right to occupy or use the entire project.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect or Program Manager in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.1.4 The Contractor must be fully qualified under any state or local licensing laws for Contractors in effect at the time and at the location of the work. The Contractor is responsible for determining that all of his subcontractors and prospective subcontractors are duly licensed in accordance with the law.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing

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conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities provided such errors, inconsistencies, omissions, differences, or nonconformities could not have been ascertained from a careful study of the Contract Documents.

§ 3.2.5 The Contractor shall make a reasonable attempt to interpret the Contract Documents before asking the Architect for assistance in interpretation or initiating a Request for Information (RFI). The Contractor shall not ask the Architect for observation of work prior to the Contractor's field superintendent's personal inspection of the work and his determination that the work complies with the Contract Documents. The Contractor shall arrange meetings for the Architect, prior to commencement of the Work, with all major subcontractors, to allow the subcontractor to demonstrate his understanding of the documents to the Architect and to allow the subcontractor to ask for any interpretation he may require. Any design errors or omissions noted by the Contractor during this review shall be reported promptly to the Architect, but it is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional unless otherwise specifically provided in the Contract Documents.

§ 3.2.6 If, in the opinion of the Architect and the Program Manager, the Contractor does not make a reasonable effort to comply with the above requirements of the Contract Documents and this causes the Architect or his Consultants to expend an unreasonable amount of time in the discharge of the duties imposed on him by the Contract Documents, then the Contractor shall bear the cost of compensation for the Architect's additional services made necessary by such failure. The Architect will give the Contractor prior notice of intent to bill for additional services related to Sections 3.2.5, 3.2.6 and 3.7 before additional services are performed.

§ 3.2.7 If the Contractor has knowledge that any of the products or systems specified will perform in a manner that will limit the Contractor's ability to satisfactorily perform the work or to honor his Warranty, he shall promptly notify the Architect in writing, providing substantiation for his position. Any necessary changes, including substitutions of materials, shall be accomplished by appropriate Modification. If the Contractor fails to perform the obligations of Section 3.2.1 and 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations.

§ 3.2.8 Prior to performing any Work, and only if applicable, Contractor shall locate all utility lines as shown and located on the plans and specifications, including telephone company lines and cables, sewer lines, water pipes, gas lines, electrical lines, including, but not limited to, all buried pipelines and buried telephone cables, and shall perform any Work in such a manner so as to avoid damaging any such lines, cables, pipes, and pipelines. In addition, Contractor shall independently determine the location of same. Contractor shall be responsible for any damage done to such utility lines, cables, pipes and pipelines during its construction work, and shall be responsible for any loss,

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damage, or extra expense resulting from such damage. The Contractor and each Subcontractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including

.1 the location, condition, layout and nature of the Project site and surrounding areas;
.2 generally prevailing climatic conditions;
.3 anticipated labor supply and costs;
.4 availability and cost of materials, tools and equipment; and
.5 other similar issues.

§ 3.2.9 Contractor shall be responsible for any damage done to such lines, cables, pipes and pipelines during its construction work resulting from its negligent conduct

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any resulting loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures, but only to the extent the Owner would be responsible for any such losses or damages under state and/or federal law.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors. . It is understood and agreed that the relationship of Contractor to Owner shall be that of an independent Contractor. Nothing contained herein or inferable here from shall be deemed or construed to (1) make Contractor the agent, servant or employee of the Owner, or (2) to create any partnership, joint venture, or other association between Owner and Contractor. Any direction or instruction by Owner or any of its authorized representatives in respect to the Work shall relate to the results the Owner desires to obtain from the Work, and shall in no way affect Contractor's independent Contractor status described herein. As part of that responsibility, Contractor shall enforce the Owner's alcohol-free, drug-free, tobacco-free, harassment-free and weapon-free policies and zones, which will require compliance with those policies and zones by Contractors' employees, subcontractors, and all other persons carrying out the Contract. Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, while on Owner's property, to refrain from committing any criminal conduct, using tobacco products, possessing or drinking alcoholic beverages, possessing or using illegal drugs or any controlled substance, carrying weapons, speaking profane and/or offensive language, or engaging in any inappropriate interactions of any nature whatsoever with students, and teachers, staff and visitors, including talking, touching, staring or otherwise contributing to a hostile or offensive environment for Owner's students and staff. All areas of campus, other than the defined construction area, shall be off limits to Contractor's forces, unless their work assignment specifies otherwise. Contractor shall also require adequate and appropriate dress and identification of Contractor's employees, subcontractors, and all other persons carrying out the Work. The Contractor shall further ensure that no on-site fraternization shall occur between personnel under the Contractor's and Subcontractor's direct or indirect supervision and Owner's students or employees and the general public. Failure of an individual to adhere to these standards of conduct shall result in the immediate termination of the employment of the offending employee from all construction on any of Owner's property and immediate removal from the site.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 The Contractor is especially cautioned to coordinate the routing of mechanical and electrical items prior to commencing these operations.

§ 3.3.5 Contractor shall bear sole responsibilities for design and execution of acceptable trenching and shoring

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procedures, in accordance with Texas Government Code, Section 2166.303 and Texas Health and Safety Code, Subchapter C, Sections 756.021, et seq. On trench excavations in excess of 5 feet in depth, Contractor shall pay a qualified engineer, experienced in the engineering design and preparation of drawings and specifications for compliance with state requirements for trenching and shoring, to prepare and professionally seal detailed drawings and specifications directing Contractor in the safe execution of trenching and shoring.

§ 3.3.6 Any time that the Contractors' employees, subcontractors and their agents and employees, and other persons or entities performing portions of the work for or on behalf of the Contractor or any of its subcontractors are on site, the work shall be supervised by a qualified employee of the Contractor.

§ 3.3.7 The Contractor shall review Subcontractor safety programs, procedures, and precautions in connection with performance of the Work. However, the Contractor's duties shall not relieve any Subcontractor(s) or any other person or entity (e.g., a supplier), including any person or entity with whom the Contractor does not have a contractual relationship, of their responsibility or liability relative to compliance with all applicable federal, state, and local laws, rules, regulations, and ordinances which shall include the obligation to provide for the safety of their employees, persons, and property and their requirements to maintain a work environment free of recognized hazards. The foregoing notwithstanding, the requirements of this Section are not intended to impose upon the Contractor any additional obligations that the Contractor would not have under any applicable state or federal laws, including, but not limited to, any rules, regulations, or statutes pertaining to the Occupational Safety and Health Administration

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 The materials, products, and the systems covered by these specifications have been selected as a standard because of quality, particular suitability, or record of satisfactory performance. It is not intended to preclude the use of equivalent or better materials, products, or systems provided that same meets the requirements of the particular project and have been approved in an addendum as a substitution prior to the submission of bids. If prior written approval in an addendum has not been obtained, it will be assumed that the Bid is based upon the materials, products, and systems described in the Bidding Documents and no substitutions will be permitted, except as provided hereinafter.

.1 If, after award of contract, the Contractor of one of his Subcontractors, or Suppliers determines that any of the products or systems specified will perform in a manner that will limit the Contractor's ability to satisfactorily perform the work or to honor the Warranty, the Contractor shall promptly notify the Architect, in writing, providing detailed substantiation for his position. Any changes deemed necessary by the Owner and Architect, including substitution of materials and change in Contract Sum, either upward or downward, if any, shall be accompanied by appropriate Modification.

.2 After the Contract has been executed, the Owner and Architect will consider a formal request for the substitution of products on the Work in place of those specified only under the conditions set forth in specification referring to Product Options and Substitutions.

.3 Requests for substitution, received by the Architect later than forty five (45) days after "Notice to Proceed" or "Date of Commencement of the Work" (whichever occurs first), may result in additional costs to the Owner. Contractor agrees to reimburse the Owner through deductive Change Order to the Contract, for all costs associated with such requests.

.4 By making request for substitutions based on Subparagraph 3.4.2 above, the Contractor

.1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equivalent or superior in all respects to that specified, and is suitable for the intended purpose;

.2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;

.3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and

.4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

.5 Substitution requests shall be submitted on the forms included herein and in accordance with the

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process established in specification referring to Product Options and Substitutions.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

.1 State law prohibits possession and/or use of alcohol and tobacco products on school property at all times.

.2 State law prohibits weapons or firearms on school property.

.3 There shall be zero tolerance for fraternization with students, teachers and any other school district personnel, Contractor will immediately remove any employee that violates this provision from the project.

.4 No glass bottles shall be brought on the construction site or Owner's property by any construction personnel.

.5 Background checks

Contractor must give advance notice to the Owner if the person or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony. The Owner may terminate this Agreement pursuant to Article 14 Termination if the Owner determines that the person or business entity failed to give notice as required by this section or misrepresented the conduct resulting in the conviction. This section requiring advance notice does not apply to a publicly held corporation. THE CONTRACTOR RELASES, INDEMNIFIES AND HOLDS HARMLESS THE OWNER FOR CONTRACTOR'S FORCES' NON-COMPLIANCE WITH OWNER'S DRUG-FREE, ALCOHOL-FREE, WEAPON-FREE, HARASSMENT-FREE, AND TOBACCO-FREE ZONES OR CONTRACTOR'S FORCES' NON-COMPLIANCE WITH CRIMINAL LAW.

§ 3.4.4 The Contractor shall disclose the existence and extent of any financial interests, whether director indirect, such Contractor may have in any Subcontractor or material supplier which the Contractor may propose for this Project.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new, unless the Contract Documents require or permit otherwise. The contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect cause by abuse, material alteration to the Work not executed by the Contractor, insufficient maintenance or maintenance not in compliance with written instructions therefor, operation not in compliance with written instructions therefor, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. The warranties set out in this section are not exclusive of any other warranties or guarantees set out in other places in the Contract Documents or implied under applicable law.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.5.3 In the event of failure in the Work, including a specified product, whether during construction, or the correction period (which shall be one (1) year from the Date of Substantial Completion, except where a longer period as specified), the Contractor shall take prompt and appropriate measures to assure correction or replacement of the defective Work or any portion thereof, including manufactured products, whether notified by the Owner or the Architect. Upon correction of warranty items, the Contractor shall provide the Owner and Architect with written notification of said correction. This obligation shall survive acceptance of the Work under the Construction Contract.

§ 3.5.4 The Contractual Correction Period for this Project is one (1) year from the date of Substantial Completion, except for any extended warranties as specified within the Contract Documents. Items of Work not completed until after the deadline for Substantial Completions shall have their warranties (general and any extended warranty periods) extended by the period of time between the deadline for Substantial Completion and the actual completion of the Work. Such warranties shall be submitted to the Owner in writing, documenting such time extensions. This correction period shall not restrict or modify extended warranties called for or provided on systems, equipment or other specific portions of the Work.

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§ 3.5.5 The Contractor shall accompany the Owner and Architect for a complete reinspection of the Project approximately eleven (11) months after the Date of Substantial Completion and shall promptly complete any observed or reported deficiencies in the Work, including any uncompleted Punch List items or outstanding and incomplete warranty items. The contractor shall provide written notification to the Owner and Architect when said Punch List items and/or additional deficiencies observed have been corrected. This obligation shall survive acceptance of the Work under the Construction Contract.

§ 3.5.6 Contractor shall certify that the Project has been constructed in conformance with the Architect's or Engineer's plan, specifications, and Contract Documents, as modified from time to time pursuant to the terms of the Contract Documents. Contractor shall fully complete a "Certification of Project Completion" as required by 19 Texas Administrative Code Section 61.1036(c) (3) (F). The Contractor shall deliver to the Owner its written guarantee, in the form attached to this contract as Exhibit "F", guaranteeing all of the work under the contract to be free from faulty materials in every particular, and free from improper workmanship, and against injury except from proper and usual wear and tear; and agreeing to replace or re-execute without cost to the Owner such work as may be found to be improper, imperfect or of unsatisfactory material and/or workmanship, without cost to the Owner, and to make good all damage caused to other work or materials, or to the Owner's property, real and personal, due to such improper, imperfect or faulty material and/or workmanship, and/or due to the required replacement or re-execution. Such warranty periods shall be maintained notwithstanding that certain systems may be activated prior to Substantial Completion as required for the satisfactory completion of the project. This guarantee shall be made to cover a period of one (1) year from the date of Substantial Completion as certified by the Architect under this Contract. This guarantee must be furnished to the Owner and approved by it before acceptance and final payment is made.

Upon written notice from the Owner, the Contractor shall promptly remedy defects as covered by his guarantee. If Contractor does not respond to Owner's written notice, either by beginning corrective work or notifying the Owner in writing stating when work will begin, within ten (10) days of receipt, the Owner may take measures to correct the work himself and Contractor will be obligated to reimburse Owner's costs. If notice of defects covered by warranty is given in writing to the Contractor on a timely basis, the obligation to provide the warranty work may extend beyond the one year warranty period until the warranty defect is remedied and accepted by the Owner. The Contractor shall provide bond coverage to extend for the one (1) year period of the guarantee to insure performance under the terms of his obligation. The provisions of this section shall be in addition to, and not in lieu of, any other rights and remedies available to the Owner.

§ 3.5.6.1 All required warranties on equipment, machinery, materials, or components shall be submitted to the Architect and Program Manager on the manufacturer's or supplier's approved forms at the time of Substantial Completion.

§ 3.5.6.2 When deemed necessary by the Owner and prior to installation of any item specifically made subject to a performance standard or regulatory agency standard under any provision of the Contract Documents, Contractor shall furnish proof of conformance to the Architect. Proof of conformance shall be in the form of

.1 an affidavit from the manufacturer certifying that the item is in conformance with the applicable standard, or

.2 an affidavit from a testing laboratory certifying that the product has been tested within the past year and is in conformance with the applicable standard, or

.3 such further reasonable proof as is required by the Architect.

§ 3.5.7 The warranties of Contractor provided in Sections 3.5.2 and 3.5.3 shall in no way limit or abridge the warranties of the suppliers of equipment and systems which are to comprise a portion of the Work and all of such warranties shall be in form and substance as required by the Contract Documents. Contractor shall take no action or fail to act in any way which results in the termination or expiration of such third party warranties or which otherwise results in prejudice to the rights of Owner under such warranties. Contractor agrees to provide all notices required for the effectiveness of such warranties and shall include provisions in the contracts with the providers and manufacturers of such systems and equipment whereby Owner shall have a direct right, but not a duty, of enforcement of such warranty obligations.

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§ 3.5.8 Contractor and Owner acknowledge that the Project may involve construction work on more than one school building for the Owner. Each building, or approved phase of each building, shall have its own, separate, and independent date of substantial completion or final completion. Contractor shall maintain a complete and accurate schedule of the dates of substantial completion, dates upon which the one-year warranty on each phase or building, which is substantially complete, will expire, and dates of final completion. If Owner, Architect or Program Manager discovers during the warranty period, deficiencies not previously reported, Contractor shall accompany the Owner, Architect and Program Manager on an inspection of such deficiencies and Contractor shall be responsible for correcting any such deficiencies not caused by the Owner or the use of the building. For extended warranties required by various sections, i.e. roofing, compressors, mechanical equipment, Owner will notify the Contractor of deficiencies and Contractor shall start remedying these defects within fifteen (15) days of initial notification from Owner. Contractor shall prosecute the work without interruption until accepted by the Owner and the Architect, even though such prosecution should extend beyond the limit of the warranty period

§ 3.6 Taxes

The Owner qualifies for exemption from State and Local Sales and Use Taxes pursuant to the provision of Article 20.04(f) of the Texas Limited Sales, Excise and Use Tax Act. Taxes normally levied on the purchase, rental and lease of materials, supplies and equipment used or consumed in performance of the Contract may be exempted by issuing to suppliers an exemption certificate in lieu of tax. Exemption certificates comply with State Comptroller of Public Accounts Ruling No. 95-0.07. Any such exemption certificate issued in lieu of tax shall be subject to State Comptroller of Public Accounts Ruling No. 95-0.09, as amended. Failure by the Contractor or Subcontractors to take advantage of the Owner's exemption and to obtain such exemption certificate shall make him responsible for paying taxes incurred on materials furnished on the Project without additional cost to or reimbursement by the Owner.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

.1 The Owner shall pay directly to the governing authority the cost of all permanent property utility assessments and similar utility connection charges.

.2 The Contractor shall pay directly all temporary utility charges (excluding permanent power), utility district/company inspection fees, temporary tap charges, and temporary water meter charges and any other similar fees assessed by jurisdictional authority having control over this Project. The Contractor shall secure and pay for all governing authorities' permit fees.

.3 Fees payable to the Texas Department of Licensing and Regulation (TDLR) for document review relative to the Elimination of Architectural Barriers Act shall be paid by the Owner and the Architect will submit the documents to the TDLR for review and approval.

.4 SWPPP

.5 The Contractor shall include in his base Proposal the permit fee required by Harris County. The Owner will be responsible for fees payable to the TDLR, any MUD and the Third-party plan reviewer.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for,

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performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.7.6 The Contractor shall comply with the provisions of Section 22.0834 of the Texas Education Code and Section 153.1117 of the Texas Administrative Code. The form of certification by the Contractor shall be supplied by the Owner, and must be supplemented by the Contractor as required by law, or as requested by the Owner.

§ 3.7.7 The Contractor shall be responsible for timely notification to and coordination with all utility companies regarding the provision of or revising of services to the Project. The Contractor shall inform the Architect and Program Manager at once when the Owner's participation is required. Connections for temporary and permanent utilities and payment for temporary utilities services required for the Work, whether the Work is new construction or renovation of an existing facility, are the responsibility of the Contractor unless otherwise agreed. If the Work is new construction, payment for permanent utility services shall be the responsibility of the Contractor until Substantial Completion.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct and approve in writing. All unused allowance amounts shall be credited back to Owner. No markup shall be allowed for the Contractor on any expenditures from Allowances or Contingency funds included in the Contract Sum.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent, project manager and necessary assistants who shall be in attendance at the Project site during performance of the Work, including Punch List work. The superintendent and project manager shall represent the Contractor, and unless provided otherwise in Section 3.1.1, communications given to the superintendent or project manager shall be binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed. In the event a substitution of superintendent is necessary, the Contractor shall reimburse the Owner, Architect and his Consultants (on a reasonable hourly basis) for additional costs incurred due to said substitution. No increase in Contract Time or Contract Sum shall be allowed in the event the Owner or Architect objects to any nominated superintendent. The superintendent must be at the construction site acting in his supervisory capacity at all times when construction is in progress. A separate full-time superintendent will be required for each school site.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 Within 30 days of being awarded an Amendment, the Contractor shall prepare and submit for the Owner and Architect's review, a construction schedule for the Work, with critical path clearly defined. The schedule shall not exceed time limits current under the Contract Documents. For further schedule requirements refer to specification section regarding project schedules in the Project Manual.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals. Requirements for the submittal schedule are outlined in specification section 01 32 16, Construction Progress Schedules. If the Contractor fails to submit a submittal schedule or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in the Contract Sum or extension of the Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.10.4 The Contractor shall submit to the Architect, with each monthly Application for Payment; a copy of the progress schedule updated to reflect the current status of the project. All schedule updates shall address the subject of how the Contractor intends to address any critical path delays previously encountered. The schedule and all updates should address submittal activities as well as actual field construction activities. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work. The Contractor's schedule shall be prepared in a format which at a minimum graphically portrays (1) the beginning and duration for each phase of the Work described in those specification sections included in the Project Manual, (2) a critical path, meaning a limited sequence of critical activities, which establishes a linked sequence of each critical activity, a delay to any of which will cause a delay in completion of the Work, and (3) the float, indicating an activity or sequence which does not necessarily have to start or end on the scheduled date(s) to maintain the schedule. Approval of a Contractor's schedule does not constitute a commitment by the Owner to furnish any Owner-furnished information or material any earlier than Owner would otherwise be obligated to furnish that information or material under the Contract Documents. Failure of the Work to proceed in the sequence scheduled by Contractor shall not alone serve as the basis for a Claim for additional compensation or time. In the event there is interference with the Work, which is beyond its control, Contractor shall attempt to reschedule the Work in a manner that will hold resulting additional time and costs to a minimum. The construction schedule shall be in a detailed format satisfactory to the Owner, the Architect and Program Manager. If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner, Program Manager and the Architect and re-submitted for acceptance. The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The accepted construction schedule shall be updated to reflect actual conditions (sometimes referred to in these General Conditions as progress reports) as set forth in Section 3.10.1 or if requested by either the Owner or the Architect. The Contractor shall take whatever action necessary to assure that the project completion schedule is met.

§ 3.10.5 The Contractor's schedule may be considered when requested extensions of time are evaluated. The Owner's need for delivery of completed Work, or portions thereof, is largely controlled by the necessities of the school calendar and operations of school programs within that calendar. These needs are reflected in any schedule completion dates

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and milestone dates set out in the Contract Documents. The Contractor shall perform the work in such a way as to not interfere with school operations, the importance of meeting milestones and completion dates. When it appears to Owner or Contractor that a Contract milestone or completion date cannot be met, Contractor will develop with the Owner, Program Manager and Architect a plan and a budget.

§ 3.10.6 The Owner shall have the right to reschedule the time of day for the performance of any part of the Work that may interfere with the operation of the Owner's premises or any tenants or invitees thereof. The Contractor shall, upon the Owner's request, reschedule any portion of the Work affecting operation of the premises during hours when the premises are not in operation. Any rescheduling of performance of the Work under this Section 3.10.6 may be grounds for an extension of the Contract Time, if permitted under Section 8.3.1, and an equitable adjustment in the Contract Sum, if: 1) the performance of the Work was properly scheduled by the Contractor in compliance with the requirements of the Contract Documents, and 2) such rescheduling is required for the convenience of the Owner and is no attributable to any act or omission of Contractor.

§ 3.11 Documents and Samples at the Site

§ 3.11.1 The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.11.2 In addition to any other requirement in the Contract Documents and prior to installation, Contractor is to furnish or cause subcontractor to furnish, for the Owner and Architect's written approval, a physical sample of each specified item, product, fixture or device which is visible by the general public and/or attached to an architecturally finished surface. Samples shall be suitably labeled, adequately protected and properly stored at the site. Samples which are approved and undamaged will be considered to be suitable for incorporation into the Work.

§ **3.11.1** The Contractor shall post all Addenda on Construction Documents prior to commencing work in the site.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

.1 Submittals shall be submitted at the earliest possible time in order to expedite delivery of critical or long lead time items. For more complex systems and equipment (such as structural steel; doors, windows and hardware; casework; mechanical, electrical, and plumbing systems and equipment; food service equipment; sound systems and the like), the Contractor shall schedule at least 30 days for the Architect or the Architect's Consultants' review and submittals shall be sequenced logically in accordance with the schedule, required fabrication and installation time.

.2 Where colors are to be selected by the Architect, the Contractor shall submit all product color samples in adequate time to allow the Architect to prepare a complete selection schedule. In general, all submittals requiring color selection shall be submitted to the Architect within four

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weeks of the date of the Contract for Construction. Regarding critical delivery items, wherever feasible, the Architect will release color selections on critical materials as they are needed.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

.1 If, in the opinion of the Architect, the Shop Drawings, Product Data, Samples and similar submittals are incomplete, indicate an inadequate understanding of the work covered by the submittals, or indicate a lack of study and review by the Contractor prior to submittal to the Architect, the submittals will be returned, unchecked, to the Contractor for correction of these three deficiencies and subsequent resubmittal. Additional service charges as outlined in 3.2.6 may be charged by the Architect in this event.

.2 The Architect will take no action on Shop Drawings, Product Data, and Samples that have not first been certified, by stamped, signed notation, as having been checked and approved by the Contractor for use in the Work, or that are not specifically required by the Contract Documents.**§ 3.12.6** By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

(Paragraph deleted)

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been accepted by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's acceptance thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's acceptance of a resubmission shall not apply to such revisions.

§ 3.12.9.1 Deviation from the requirements of the Contract Documents indicated on shop Drawings, Product Data, and Samples, does not constitute the required notification "in writing.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services,

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certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.12.11 The Contractor shall submit complete Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents to the Architect at least thirty (30) days prior to the date the Contractor needs the reviewed submittals returned. Where colors are to be selected by the Architect, submit all Samples in adequate time to allow the Architect to prepare a complete selection schedule. In general, all submittals requiring color selection shall be submitted to the Architect within four weeks of the date of the contact for construction.

§ 3.12.12 The Contractor shall submit digital PDF's of Shop Drawings, Product Data, and similar submittals in the proper format according to the procedures stipulated within the Contract Documents. Digitally submitted Shop Drawings will be reviewed and marked by the Architect and/or his consultants and returned to the Contractor for his use, distribution, correction or resubmittal as required. Contractor corrections or revisions shall be resubmitted to the Architect in accordance with same procedures. The digitally marked up prints will be retained by the Architect and his consultants. Samples shall be submitted directly to the Architect for review.

§ 3.12.13 The Contractor shall provide MEP coordination drawings within a schedule mutually agreed upon by the Team and prior to installing the Work, showing how all piping, ductwork, lights, conduit, equipment, etc. will fit into the ceiling space allotted, including clearances required by the manufacturer, by code, or in keeping with good construction practice. Space for all trade elements must be considered on the same drawing. Drawings shall be at ¼ inch per foot minimum scale and shall include invert elevations and sections required to meeting intended purpose. The Contractor may propose an alternate method of accomplishing MEP coordination. If the alternate method is approved by the Team, it may be utilized.

§ 3.13 Use of Site

§**3.13.1** The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment. When the Work is to be performed at an existing school location, Contractor shall schedule and perform the Work in a manner that does not compromise the safety to school students, faculty and staff, and does not unreasonably disrupt or interfere with the continuing normal routine of the school. If a School Operations Parameters Statement is a part of the Contract Documents, Contractor will comply with its terms, at no increase in price.

§ 3.13.2 Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction material and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

§ 3.13.3 The Contractor and any entity for which the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner.

§ 3.13.4 Contractor shall ensure that the Work, at all times, is performed in a manner that affords the Owner reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building material and equipment likely to cause hazardous conditions. Without limitation of any other provision of the Contract Documents, Contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of: 1) any area and buildings adjacent to the site or the Work or 2) the building in the event of partial occupancy.

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§ 3.13.5 Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrance and parking areas other than those designated by the Owner. Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site and the Building, as amended from time to time

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.14.3 Leave all chases, holes and openings, straight and true, of proper size, and cut them into existing work as may be necessary for the proper installation of the work. Consult with all Subcontractors concerned, regarding proper locations and size. In case of conflict between requirement for cutting and patching and any other requirement of the Work, submit request for direction before proceeding with the Work. In case of failure to leave or cut them in the proper place, openings shall be cut afterward at no expense to the Owner. No excessive cutting will be permitted, nor shall any piers or other structural members be cut without prior approval. After such work has been installed, satisfactorily and carefully fit around, close up, repair, patch, and point up all cuts. Work shall be done with proper tools by workmen of the particular trade to which work belongs and shall be done without extra expense to the Owner. No description of specific cutting, patching, digging, etc., required for the work under a Specification Section that may be required for the proper accommodation of that work to the work of other trades shall relieve the Contractor from responsibility described above.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.15.3 Prior to the Architect's inspection for Substantial Completion the Contractor shall clean exterior and interior surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces; clean equipment and fixtures to a sanitary condition; replace air filters in mechanical equipment; clean roof, gutters, and downspouts; remove obstructions and flush debris from drainage systems; clean site; sweep paved areas and rake clean other surfaces; remove trash and surplus materials from the site; and make the Work ready in all respects for immediate and full use by the Owner.

§ 3.15.4 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor or deducted from the final payment to Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Program Manager, their designated representative, and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or

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manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 TO THE FULLEST EXTENT PERMITTED BY LAW, CONTRACTOR SHALL INDEMNIFY DEFEND AND HOLD HARMLESS THE OWNER AND ITS TRUSTEES, OFFICERS, AGENTS, AND EMPLOYEES (COLLECTIVELY, THE "INDEMNIFIED PARTIES") FROM AND AGAINST ALL CLAIMS, LOSSES, EXPENSES, COSTS, DEMANDS, SUITS, CAUSES OF ACTION, AND DAMAGES, INCLUDING WITHOUT LIMITATION, ATTORNEYS' FEES AND EXPENSES, ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE OR DEATH OF ANY EMPLOYEE OF CONTRACTOR, ITS AGENTS, OR ITS SUBCONTRACTORS OF EVERY TIER, EVEN IF THE BODILY INJURY, SICKNESS, DISEASE OR DEATH IS CAUSED BY OR ALLEGED TO HAVE BEEN CAUSED BY THE NEGLIGENCE, FAULT OR STRICT LIABILITY OF ANY OF THE INDEMNIFIED PARTIES.

FOR ALL CLAIMS NOT ADDRESSED IN THE ABOVE PARAGRAPH, CONTRACTOR SHALL INDEMNIFY, DEFEND AND HOLD HARMLESS THE OWNER AND ITS TRUSTEES, OFFICERS, AGENTS, AND EMPLOYEES AND (COLLECTIVELY, THE "INDEMNIFIED PARTIES"), FROM AND AGAINST ALL CLAIMS, LOSSES, EXPENSES, COSTS, DEMANDS, SUITS, CAUSES OF ACTION, AND DAMAGES, INCLUDING WITHOUT LIMITATION, ATTORNEYS' FEES AND EXPENSES, OF ANY NATURE WHATSOEVER ARISING OUT OF OR RELATED TO THIS AGREEMENT OR THE WORK TO BE PERFORMED UNDER THIS AGREEMENT, BUT ONLY TO THE EXTENT OF THE NEGLIGENCE OR OTHER FAULT OF THE CONTRACTOR, ITS AGENTS, REPRESENTATIVES, EMPLOYEES OR SUBCONTRACTORS OF ANY TIER.

§ 3.18.2 It is understood and agreed that Subparagraph 3.18 above is subject to, and expressly limited by, the terms and conditions of TEX. CIV. PRACT. & REM. CODE ANN. 130.001-130.005 (Vernon Supp. 1989), as amended or modified, or any successor statute. Contractor shall **not** be obligated under Subparagraph 3.18 to indemnify or hold harmless Program Manager, Architect or any agent, servant of employee of Architect from liability or damage that is caused by or results from:

.1 defects in plans, designs or specifications prepared, approved or used by the Architect; or

.2 negligence of the Architect in the rendition or conduct of professional duties called for or arising out of the Contract Documents and the plans, designs or specifications that are a part of the Contract Documents; and arises from:

.1 personal injury or death;

.2 property injury; or

.3 any other expense that arises from personal injury, death or property injury.

§ 3.18.3 It is agreed with respect to any legal limitations, now or hereafter in effect and affecting the validity or enforceability of the indemnification obligation under Paragraph 3.18, such legal limitations are made a part of the indemnification obligation and shall operate to amend the indemnification obligation to the minimum extent necessary to bring the provision into conformity with the requirements of such limitations, and as so modified, the indemnification obligation shall continue in full force and effect.

§ 3.19 Record Drawings

§ 3.19.1 Refer Owner's Closeout Procedures

§ 3.20 Prevailing Wage Rates

§ 3.20.1 As required by Chapter 2258 of the Texas Government Code Title 10 Prevailing Wage Rate, no employee used in this construction may be paid less than the minimum prevailing wage rate in effect for the Owner.

§ 3.20.2 The Contractor and each Subcontractor and Sub-subcontractor shall pay to all laborers, workmen, and mechanics employed in execution of this Contract not less than rates set forth by law for each craft of type of workman or mechanic needed to execute this Contract.

§ 3.20.3 Determination of prevailing wages shall not be construed to prohibit payment of more than the rates

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identified.

§ 3.21 Antitrust Violations

§ 3.21.1 Contractor hereby assigns to Owner any and all claims for overcharges associated with this Contract which arise under the antitrust laws of the United States, 15 U.S.C.A. Section 1 et.seq. (1973). The Contractor shall include this provision in his contracts with each Subcontractor and Supplier. Each Subcontractor shall include such provision in contracts with Sub-subcontractors and suppliers.

§ 3.22 Third-Party Beneficiary

§ 3.22.1 No person or entity shall be deemed to be a third-party beneficiary of any provision(s) of this Contract; nor shall any provision(s) hereof be interpreted to create a right of action or otherwise permit anyone not a signatory party to the Contract to maintain an action for personal injury or property damage.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 Except as expressly provided herein, the Contractor shall not be relieved of Contractor's obligation to perform the Work in strict accordance with the Contract Documents by the responsibilities, activities or duties of the Architect.

§ 4.2 Administration of the Contract

§ 4.2.1 Certain portions of the administration of the Contract will be performed by the Architect, others by the Program Manager. Both the Architect and the Program Manager will be treated as the Owner's representative to the extent set out in the Contract Documents. Neither the Architect nor the Program Manager shall have the authority to act on behalf of Owner unless such authority is expressly granted in the Contract Documents, nor shall such authority be implied from any act or representation of the Architect or Program Manager..

§ 4.2.2 The Architect, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the work, and (3) to determine in general if the work is being performed in a manner indicating that the work, when fully completed, will be in accordance with the Contract documents. The Architect will be required to make on-site inspections as necessary to keep the Owner informed of the progress of the Work and as necessary to guard the Owner against defects and deficiencies in the Work. The Architect will neither have control over or charge of, no be responsible for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1. Further:

.1 The Contractor expressly recognizes that the Architect does not owe him any duty to supervise or direct his work as to protect the Contractor from the consequences of his own acts or omissions.

.2 Upon reasonable request by the Owner, the Contractor shall accompany the Owner and Architect on an observation tour(s) of the building and shall note any defects and start remedying these defects within ten (10) days of the observation tour. Contractor shall prosecute the Work without interruption until accepted by the Owner and the Architect.

.3 Section 4.2.2, and the provisions of the Architect's Agreement with the Owner shall govern the number of site visits by the Architect. In this case, the Owner and Architect may agree in writing on an alternative site visit schedule that is appropriate for this particular project.

.4 If during the Architect's site visits the Architect observes any deviation from requirements of the Contract Documents, the Architect (or designee) shall report within three (3) business days to the Owner any such deviation. A copy of said report shall be sent to the

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Contractor. Failure to observe or report any deviation shall not be a waiver to subsequently require correction of the same, similar or other deviations.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect shall have authority to reject Work that does not conform to the Contract Documents. The Architect shall be required to promptly notify the Owner of any non-conforming Work and shall reject such non-conforming Work unless the Owner objects to the rejection in writing within twenty-four (24) hours of such notification. Whenever the Architect considers it necessary or advisable for implementation of the intent of the Contract documents, the Architect will have authority to require inspection or testing of the Work in accordance with the provisions of the Contract Documents, whether or not such Work is fabricated, installed or completed. Performance of any additional inspection or testing, which would result in additional cost to the Owner, shall require advance notice to and approval of the Owner. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work, except when the Contractor's inability to perform the Work is a result of design flaw, error or omission.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.8.1 Allowance Expenditure will be authorized using Allowance Expenditure authorizations (AEA) executed by the Owner, the Architect and the Contractor. All Allowance Expenditure Authorizations will be incorporated into the contract by Change Order at the completion of the project. Work authorized by an AEA may be invoiced as it is completed.

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§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 All decisions on matters relating to aesthetic effect shall initially be made by the Architect; however, all such decisions are subject to the Owner's written approval.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor. Wherever relevant, the term "Subcontractor" shall also include a person, or entity who supplies material or equipment for the Project.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

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§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution. Prior to such change the Contractor shall notify the Architect of his intent and reasons for such proposed change**§ 5.2.5** The Contractor shall submit the list of proposed Subcontractors on AIA Document G805. The Contractor may obtain blank copies from the Architect.

§ 5.2.6 Contractor shall promptly notify the Owner, Architect and Program Manager of any material defaults by any subcontractor.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract, but only to the extent permitted by law.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements The Owner reserves the right to perform other construction work, maintenance and repair work and school program operations at the site and near the site during the time period of the Work. Owner may perform other Work with separate Contractors or forces. Owner shall have access to the building on the site at all times..

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

(Paragraphs deleted)

§ 6.1.3 The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the other until subsequently revised.

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§ 6.1.4 It shall be the responsibility of the Contractor to assist, review, coordinate, and schedule work performed by any of Owner's separate contractors including the hazardous materials abatement contractor. Contractor shall not be required to contract directly with the hazardous materials abatement contractor's and Owner's separate contractor's work, including required monitoring, testing and inspections by independent firms, with the Work under this Agreement. The Contractor shall be totally responsible for coordination between its Subcontractors and the hazardous materials abatement contractor and any other Owner's separate contractors. Contractor will cooperate with the Owner to allow site access and staging areas for hazardous materials abatement contractor and Owner's separate contractors and consultants. Contractor shall review Owner's contract with the hazardous materials abatement contractor and Owner's separate contractors and become familiar with the requirements and scope of services contain therein. Contractor shall continually review the work performed by the hazardous materials abatement contractor and Owner's separate contractors and immediately notify the Owner and Program Manager if at any time during the performance of Contractor's work, the hazardous materials abatement contractor or any of Owner's separate contractors fail, in any way, to provide sufficient, competent manpower or timely perform its services.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.1.1 No change in the Contract Sum and/or Contract Time will be allowed for a change in the Work unless, prior to performing the changed Work, the Contractor has provided the Owner in writing with a proposal for any change in price and/or change in Contract Time caused by the change in Work, and a Change Order is subsequently executed. A field directive or field order shall not be recognized as having any impact upon the Contract Sum or the Contract Time.

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§ 7.1.1.2 Contingency Allowance Expenditure Authorization. A change in the work that does not require a change in Contract Sum or Contract Time may be paid from a designated Project Allowance. A Contingency Allowance Expenditure Authorization (CAEA) is a written order prepared by the Architect and signed by the Architect, Owner, Contractor and Program Manager directing a change in the Work.

§ 7.1.2 A Change Order shall be based on agreement among the Owner's Board of Trustees, Contractor, and Architect, except when the Contract balance is amended as a result of Owner's Right to Carry out the Work under Section 2.4. or the Owner's assessment of liquidated damages as allowed by the Contract Documents. In such event, the Change Order is deemed approved by Contractor, and Contractor's signature(s) are not required. A Construction Change Directive requires agreement by the Owner, or the Owner's representative, and Architect, and may or may not be agreed to by the Contractor; an order for a minor change may be issued by the Architect alone.
§ 7.1.2.1 Contractor shall make no change in the materials used or in the specified manner of constructing and/or installing the work or supply additional labor, services, or materials beyond that actually required by the terms of the Contract Documents, unless made pursuant to a written order from Owner authorizing Contractor to proceed with the change. No claim for an adjustment of the contract price will be valid unless so ordered.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders
§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Methods used in determining adjustments to the Contract Sum shall be determined in one or more of the ways listed below. The first method listed shall be used unless the Architect determines that the method is inappropriate, in which case another method shall be selected:

.1 By mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation. Where additional Work is involved, any lump sum over the amount of $10,000.00 shall be broken down to represent the estimated cost of labor and materials plus mark-ups to cover overhead and profit.

.1 To compensate the Contractor, Subcontractor, or Sub-subcontractor actually performing a part of the Work for the combined cost of overhead and profit, the performing party shall be entitled to a single mark-up not to exceed 10% of the estimated cost of that part of the Work.

.2 To compensate (a) the Contractor for the combined cost of overhead and profit on Work performed by Subcontractors, or (b) Subcontractors for the combined cost of overhead and profit on Work performed by Sub-subcontractors, the Contractor or Subcontractor shall be entitled to a single mark-up not to exceed 5% of the subcontract amount.

.3 When a Sub-subcontractor performs the Work of a change, the maximum mark-up not to exceed 10% for combined overhead and profit shall be used only by the Sub-subcontractor. The Contractor and Subcontractor would each be entitled to a single mark-up not to exceed 5% of the cost to them for the Subcontractor and Sub-subcontractor, respectively.

.2 By Unit Prices stated in the Contract Documents or subsequently agreed upon. Additional mark-ups for overhead and profit will not be allowed in Unit Price work.

.3 By cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee.

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.4 Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.2.2 shall be limited to the costs established in Sections 7.3.7.1 through 7.3.7.5.

§ 7.2.3 Agreement on any Change Order shall constitute a final settlement of all claims by the Contractor directly or indirectly arising out of or relating to the change in the Work which is the subject of the Change Order, including, but not limited to, all direct and indirect costs and impact costs associated with such change and any and all adjustments to the Contract Sum and the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3

(Paragraph deleted)

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the methods described in Section 7.2.2 or as provided in Section 7.3.4.

(Paragraph deleted)

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, directly related to the change and required by Contract Documents (unless the change is charged to an allowance already included in the Contract Sum, in which case additional mark-ups for these items will not be allowed; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits

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covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

§ 7.5 Allowable Markups for Changes in the Work

§ 7.5.1 Unless otherwise directed, the procedure and markup of the costs for additional work shall be determined in the following manner:

.1 Upon Change Proposal request, the Contractor shall quote the cost for changes in the work showing separately, credits and additional costs broken down by headings used in the Schedule of Values. Further breakdown into units of labor and materials may be required if agreement on cost cannot be reached using the breakdown by headings. The final cost shall be the amount of the Total Contract Value Change shown on the Change Proposal signed by the Contractor and Owner. For general construction work, not subcontracted, the Contractor shall consider as costs the actual invoice amount for additional materials, the sales tax on additional materials when applicable, the wages paid for additional direct labor, plus the Contractor's usual markup of wages to cover additional labor related costs such as insurance, taxes and fringe benefits.

.2 On changes executed within the Owner's Contingency Allowance, Contractor shall have included costs for combined overhead and profit, to the extent permitted by the Contract Documents, and General Conditions costs, including the cost of superintendents, field office expense, temporary facilities and services, small hand tools, construction equipment not specifically provided for the change in hand, home office expense, bond and building insurance premiums, and managing the Subcontractor's work, in his Base Contract amount. Allowed overhead and profit fee on Owner's Contingency Allowance changes to be included in the total cost to the Owner shall be based as follows:

.1 For each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor's of Sub-subcontractor's own forces, ten percent (10%) of the cost.

.2 For each Subcontractor, for Work performed by the Subcontractor's Sub-subcontractors, five percent (5%) of the amount due the Sub-subcontractors.

§ 7.5.2 If any additional Work is authorized outside of or in excess of the Owner's Contingency Allowance, the combined overhead and profit for this work shall be based as follows:

.1 For the Contractor, for Work performed by the Contractor's own forces, a maximum total markup of ten percent (10%) of the actual cost on a lump sum project, or the Contractor's Construction Phase Fee on a Guaranteed Maximum Price Project.

.2 For Work performed by the Contractor's Subcontractor(s), five percent (5%) of the amount due the Subcontractor(s).

.3 For each Subcontractor or Sub-subcontractor involved, for work performed by that Subcontractor's or Sub-subcontractor's own forces, a maximum markup of ten percent (10%) of the actual cost.

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.4 For each Subcontractor, for work performed by the Subcontractor's Sub-subcontractors, five percent (5%) of the amount due the Sub-subcontractor.
.5 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.7.

§ 7.5.3 In order to facilitate checking of quotations for extras or credits, all proposals, (except those so minor that their propriety can be seen by inspection), shall be accompanied by a complete and detailed itemization of costs including labor, materials, and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change be approved without such itemization.

§ 7.5.4 Change orders, as they are accepted by the Owner, shall be entered under heading "Change Orders" in the next current Request for Payment.

§ 7.5.5 All credits to or deductions from the Contract Sum, a Contingency or an Allowance shall be calculated using the same methodology set forth in this Section 7.5. All unused Contingency or Allowance amounts shall be credited back to Owner prior to final payment, along with any markups included in the Contract Sum or GMP on such unused amounts.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined. See further definition of "Day" in Section 1.9.10.§ 8.2 Progress and Completion

(Paragraph deleted)

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other unforeseeable causes beyond the Contractor's control, or by other causes which the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine. **No extensions of the Contract Time will be granted for inclement weather, except for Force Majeure events consisting of named storms or government declared emergencies resulting from extreme weather.**

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

§ 8.3.4 The parties hereto agree that time is of the essence of this Contract and that pecuniary damages would be suffered by the Owner if the Contractor does not substantially complete all Work called for in the

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Contract Document by the specified date, which damages are, by their very nature, difficult of ascertainment. It is therefore expressly agreed, as a part of the consideration inducing the Owner to execute this Contract that the Owner may deduct from the final payment made to the Contractor a sum equal to the amount stated in the Contract Documents, per phase for each and every Calendar Day beyond the agreed date which the contractor has agreed to for Substantial Completion of the Work included in the Contract Documents. It is expressly understood that said sum per day is agreed upon as a fair estimate of the pecuniary damages which will be sustained by the Owner in the event that the Work is not substantially completed within the agreed time, or with the legally extended time, if any, otherwise provided for herein. Said sum shall be considered as liquidated damages only, and in no sense shall be considered a penalty or forfeiture; said damage being caused by additional compensation to personnel, and other miscellaneous increased costs, all of which are difficult of exact ascertainment. The liquidated damages assessed herein shall be Owner's sole remedy for time delays between the deadline for substantial completion and Contractor's achievement of substantial completion.

§ 8.3.5 Failure to complete and close-out the Project, and complete all Punch List items, within sixty (60) days after the scheduled Substantial completion date will additionally entitle the Owner to deduct from the final payment made to the Contractor a sum equal to the amount stated in the Contract Documents, per phase, for each and every Calendar Day beyond the 60-day close-out period. It is expressly understood that said sum per day is agreed upon as a fair estimate of the pecuniary damages which will be sustained by the Owner in the event that the Project close-out does not occur on a timely basis. Said sum shall be considered as liquidated damages only and in no sense shall be considered a penalty or forfeiture; said damage being caused by additional compensation to personnel, and other miscellaneous increased costs, all of which are difficult of exact ascertainment. If the Contractor is delayed through no fault of the Owner, the Substantial Completion is not achieved by the agreed contract completion date, the Project close-out period of sixty (60) days will not be extended by the number of days of delay past the actual Substantial completion date and will remain based upon the agreed contract completion date.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.1.1 The Owner is exempt from payment of Texas State Sales Tax on materials required for the Work. Therefore, to comply with the law, the Contract Sum shall be broken down into the amount of cost for labor and the amount of cost for materials. This breakdown shall be provided by the Contractor within ten (10) days of award of Contract.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

§ 9.2.1 Before the first Application for Payment, the Contractor shall submit to the Architect and Program Manager a schedule of values fairly allocating the various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as reasonably required by the Architect and Program Manager, and updated for changes in the Work, the schedule of values shall be used only as a basis for reviewing the Contractor's Applications for Payment and is not to be taken as evidence of market or other value. The schedule shall not overvalue early job activities. Each item shall include a pro-rata portion of overhead and profit. The schedule shall follow the divisions of the Specifications so far as practicable and shall contain line items for equipment and system start up and testing.

§ 9.2.1 General Contractor's cost for Contractor's fee, bonds and insurance, General Conditions, etc., shall be listed as individual line items.

§ 9.2.2 Schedule of Values shall break each line into materials and labor. Once approved by the Owner and Architect, it shall be used as basis for reviewing Application for Payment but not be taken as evidence of market or other value.

§ 9.2.3 Contractor's cost for various construction items shall be detailed. For example, concrete work shall be subdivided into footings, grade beams, floor slabs, paving, etc. These subdivisions shall appear as individual line items.

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§ 9.2.4 On major subcontracts, such as mechanical, electrical, and plumbing, the Schedule shall indicated line items and amounts in detail, (for example; underground, major equipment, fixtures, installation of fixtures, start up, etc.)

§ 9.2.5 Costs for subcontract work shall be listed without any addition of General Contractor's costs for overhead, profit or supervision.

§ 9.2.6 The Contractor shall include a value for the coordination documents/drawings on the schedule of values.

§ 9.2.7 The Contractor shall include a value for the correction of deficiencies noted by the Commissioning Agent and the Test, Adjust and Balance consultant on the schedule of values for each sub-contractor subject to commissioning and test, adjust and balance requirements.

§ 9.3 Applications for Payment

§ 9.3.1 No later than 3 working days prior to the first Wednesday of each month, submit an itemized Application for Payment, supported by such data sustaining the Contractor's right to payment as the Owner or Architect may require, and reflecting retainage, as provided elsewhere in the Construction Documents. Information on the form shall be divided into the same last day of the month preceding, which shall also be the basis of payment or as agreed by the Owner, Contractor and Architect by verification at the site, prior to submittal.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives but not yet included in Change Orders.

§ 9.3.1.2 Contractor agrees, for purposes of Texas Government Code 2251.042, receipt of the Certified Applications for Payment from the Architect shall not be construed as receipt of an invoice by the Owner. Contractor further agrees that Program Manager's receipt of the Certificate of Payment shall be construed as receipt of an invoice by the Owner, for purposes of Texas Government Code Section 2251.042

§ 9.3.2 Payments will be made on account of materials or equipment 1) incorporated in the Work; 2) suitably stored at the site; or 3) suitably stored at some off-site location, provided the following conditions are met for off-site storage:

.1 The location must be agreed to, in writing, by the Owner and Surety.

.2 The location must be a bonded warehouse.

.3 Surety must agree, in writing, to each request for payment.

.4 The Contractor must bear the cost of the Owner's and Architect's expenses related to visiting the offsite storage area for confirmation.

Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance (naming the Owner as insured) and transportation to the site for those materials and equipment stored off the site. Under no circumstances will the Owner reimburse the Contractor for down payments, deposits, or other advance payments for materials or equipment.

The Contractor acknowledges that the review of materials and/or equipment stored off the side is an additional service of the Architect, and the Contractor shall be charged for that service. The cost for such service will be established by the Architect and is not subject to appeal.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.3.4 The Contractor shall submit requests for payment in duplicate, using AIA Document G702, Application and Certificate of Payment, as the cover sheet. Continuation sheets showing in detail the amounts requested, etc., shall be submitted using AIA Document G703, Continuation Sheet, or a computerized version of these documents previously approved for use. The information provided on the continuation sheets in the Description of the Work and Scheduled

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Values columns shall match the corresponding information shown on the approved Schedule of Values. All blank spaces on AIA Document G702, Application and Certificate of Payment, must be completed and the signatures of the Contractor and Notary Public shall be original on each form. By submitting his application for payment, the Contractor certifies that the individual signing the application is authorized to do so.

§ 9.3.5 The Contractor shall submit the Fort Bend ISD Subcontractor Progress Assessment Form with each application for payment requesting payment be made for Work performed by a subcontractor that qualifies as a "small business" pursuant to FBISD Board Policy CV (Local). The Contractor shall also ensure that, once Contractor makes the applicable payment to the Small Business Subcontractor, the Subcontractor completes the Fort Bend ISD Subcontractors/Subcontractors/Suppliers Payment Certification Form in its entirety and Contractor agrees to submit the completed copies to Owner with the next application for payment. The completed Fort Bend ISD Subcontractors/Subcontractors/Suppliers Payment Certification Form must be received by the Owner before any further payment will be made to Contractor for any Work performed.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect and Program Manager to the Owner, based on the Architect's and Program Manager's evaluation of the Work and the data comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Architect's and Program Manager's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, the results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect and Program Manager. The issuance of a Certificate for Payment will not be a representation that the Architect and Program Manager has (1) made exhaustive or continuous on-site inspections to check the quality of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from the Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to Payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1

The Architect or Program Manager may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect or Program Manager's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect or Program Manager is unable to certify payment in the amount of the Application, the Architect or Program Manager will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect or Program Manager cannot agree on a revised amount, the Architect or Program Manager will promptly issue a Certificate for Payment for the amount for which the Architect or Program Manager is able to make such representations to the Owner. The Architect or Program Manager may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the or part of a Certificate for Payment previously issued, to such extent necessary, in the Architect's or Program Manager's opinion, to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of:

1. Defective Work not remedied;
2. Third party claims field or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
3. Failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
4. Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
5. Damage to the Owner or another contractor;

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6. Reasonable evidence that the Work will not be completed within the Contract Time and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
7. Persistent failure to carry out the Work in accordance with the Contract Documents; or
8. Failure to submit a written plan indicating action by the Contractor to regain the time schedule for completion of Work within the Contract Time

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.5.5 If the work has not attained Substantial Completion by the date agreed upon and set forth in the Amendments, subject to extensions of time as described in the Contract Documents, Owner may, in sole discretion, direct Architect or Program Manager to withhold payment to Contractor to the extent necessary to reserve sufficient funds to complete the construction of the Project and to cover liquidated damages assessed against Contractor up to the time of the Application for Payment and to the time it is reasonably anticipated Substantial Completion will be achieved. The Owner shall not be deemed in default by reason of withholding payment as provided for in Sections 9.3.4, 9.4.3, 9.5.1, or this Section.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make progress payments in accordance with the following Section which shall be inserted as Article 5, Progress Payments, in the Owner-Contractor Agreement, AIA Document A101, 2017 Edition.

.1 Based upon the applications for payment and supporting documents submitted to the Architect by the Contractor and certification of the amount payable by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided in the Contract Documents for the period ending the last day of the month as follows:

.2 Not later than twenty (20) working days following the first Wednesday of each month, ninety-five percent (95%) of the portion of the Contract Sum properly allocable to labor, materials, and equipment incorporated in the Work and ninety-five percent (95%) of the portion of the Contract Sum properly allocable to materials and equipment suitably stored at the site or at some other location agreed upon in writing, for the period covered by the Application for Payment, less the aggregate of previous payments made by the Owner. Applications for Payment shall be submitted by the first Wednesday of the month.

.3 Upon Substantial Completion of the entire Work, a sum sufficient to increase the total payments to ninety-five percent (95%) of the Contract Sum, less such amounts as the Architect shall determine for all incomplete Work and unsettled claims as provided in the Contract Documents.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. More specifically, if only five percent (5%) retainage is withheld by the Owner on payments to the Contractor, then the Contractor shall withhold only five percent (5%) retainage on payments to subcontractors; and subcontractors shall withhold only five percent (5%) retainage on payments to sub-subcontractors. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers

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to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.6.9 Within seven (7) calendar days of receipt of payment from the Owner, the Contractor shall pay each subcontractor, out of the amount of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payment to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner. Owner is not obligated to monitor payments to Subcontractors or Sub-subcontractors, and nothing in this section shall create any right on the part of a Subcontractors or Sub-subcontractor against Owner, Architect or Program Manager. In compliance with Texas Government Code Section 2251.022, the Contractor shall, within ten (10) days following receipt of payment from the Owner, pay all bills for labor and materials performed and furnished by others in connection with the Work, and shall, if requested, provide the Owner with evidence of such payment. Contractor's failure to make payments within such time shall constitute a material breach of this Contract. Contractor shall include a provision in each of its Subcontractor's imposing the same payment obligations on its Subcontractors as are applicable to the Contractor hereunder, and if the Owner so requests, shall provide copies of such Subcontractor payments to the Owner. If the Contractor has failed to make payment promptly to the Contractor's Subcontractors or for materials or labor used in the Work for which the Owner has made payment to the Contractor, then the Owner shall be entitled to withhold payment to the Contractor in part or in whole to the extent necessary to protect the Owner.

§ 9.6.10 Contractor shall not withhold as retainage a greater percentage on Subcontractors or material men than the percentage Owner withheld as retainage from payments to the Contractor.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within ten days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within ten days after the date established in the Contract Documents, the amount certified by the Architect , then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

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§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents In order to initiate and facilitate the preparation of the Contractor's list of items to be completed or corrected (Punch List), the Architect and Program Manager, if requested by the Contractor, will inspect a few representative rooms with the Contractor's superintendent and the office project manager to assist the Contractor in the preparation of the Contractor's Punch List. The Contractor's superintendent shall participate in the preparation of the Contractor's Punch List that is submitted to the Architect and shall personally inspect each and every item himself before certifying to the Architect that listed items have been corrected. Should the Architect determine that the Contractor's Punch List lacks sufficient detail or requires extensive supplementation, the Punch List will be returned to the Contractor for revision and the inspection for determining the Date of Substantial Completion will be delayed until the Punch List submitted is a reasonable representation of the work to be completed. To further facilitate completion of the Work the Contractor's superintendent shall accompany the Architect and his consultants during their inspections and the preparation of their supplements to the Punch List and the superintendent shall record or otherwise take note of those supplementary items. The Architect will endeavor to furnish to the Contractor typed, hand-lettered, written or recorded supplements to the Punch List in a prompt manner; however, any delay in the Contractor's receiving said supplements from the Architect shall not be cause for a claim for additional cost or extension of time as the Contractor's superintendent shall have been in attendance during the inspections of the Architect and his consultants and will have been expected to taken his own notes. Furthermore, a significantly large number of items to be completed or corrected will preclude the Architect from issuing a Certificate of Substantial Completion. The Owner and Architect will be the sole judges of what constitutes a significantly large number of items.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.8.6 In order for the project or a major portion thereof to be considered substantially complete, the following conditions must be met:

.1 All inspections by governmental authorities having jurisdiction over the project must have been finalized, any remedial work required by those authorities must have been completed, and Certificates of Occupancy and similar governmental approval forms must have been issued and copies delivered to the Owner and Architect.

.2 All work, both interior and exterior, shall have been completed and cleaned except minor items which if completed after occupancy, will not, in the Owner's opinion, cause interference to the Owner's use of the building or any portion thereof. A significantly large number of items to be completed or corrected will preclude the Architect from issuing a Certificate of Substantial Completion. The Owner and Architect will be the sole judge of what constitutes a significantly large number of items.

The following items are a partial specific list of requirements, as applicable to the Project, that must be completed **prior** to established Substantial Completion of all portions of the work (Including the Substantial Completion of the

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commissioning phase).

1. All fire alarm system components must be completed and demonstrated to the Owner.
2. Local fire marshal approval certificate, or similar Certificate of Occupancy from the governing agency, must be delivered to the Owner.
3. All exterior clean-up and landscaping must be complete.
4. All final interior clean-up must be complete.
5. All HVAC air and water balancing must be complete.
6. All required commissioning must be complete.
7. All Energy Management Systems must be complete and fully operational and demonstrated to the Owner.
8. All communications equipment, telephone system, and P.A. systems must be complete and demonstrated to the Owner.
9. All final lockset cores must be installed and all final Owner directed keying completed.
10. All room plaques and exterior signage must be completed.
11. All Owner demonstrations must be completed including kitchen equipment, HVAC equipment, plumbing equipment, and electrical equipment.
12. A final certificate of occupancy must be signed by the Contractor and delivered to the Owner.

§ 9.8.7 After the date of Substantial Completion of the Project, as evidenced by the Certificate of Substantial Completion, G704 current edition, the Contractor will be allowed a period of thirty (30) days (unless extended by mutual agreement or provision of the Contract) within which to correct all deficiencies attached to the Certificate of Substantial Completion. Failure of the Contractor to complete such corrections within the stipulated time will be reported to the Contractor's Surety. In the report of deficiency, the Contractor and Surety will be informed that, should correction remain incomplete for fifteen (15) additional days, the Owner may initiate action to complete corrective work out of the remaining Contract funds in accordance with Section 14.2. Additional costs of the Owner, Architect, and other consultants incurred because of the Contractor's failure to complete the correction of deficiencies within thirty (30) days after the date of Substantial Completion (unless extended by mutual agreement or provision of the Contract) may be deducted from the funds remaining to be paid to the Contractor. Should corrective work following Substantial Completion require more than one reinspection after notification by the Contractor that corrections are complete, the cost of subsequent inspections may also be deducted from funds remaining unpaid to the Contractor.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect and the Program Manager finds the Work acceptable under the Contract Documents and the Contractor fully performed, the Architect and the Program Manager will promptly prepare, sign and issue a Certificate of Final Completion and a final Certificate for Payment certifying to the Owner that, on the basis of the Architect's and the Program Manager's on-site

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visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance, including all retainages found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's and the Program Manager's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees. Prior to final payment, the Contractor shall meet all of the requirements of Owner's Closeout Procedures.**§ 9.10.3** If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

(Paragraph deleted)

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

§ 9.10.6 Final Payment, constituting the entire unpaid balance of the Contract Sum, shall be paid by the Owner to the Contractor thirty-one (31) days after Substantial Completion of the Work unless otherwise stipulated in the Certificate of Substantial Completion, provided the Work has then been completed, the Contract fully performed, all Contract Close Out Documents have been submitted, and the Final Certificate for Payment has been issued by the Architect. The final payment will not be made until all of these conditions have been satisfied.**§ 9.10.7** Contractor agrees that the Owner may place and install as much equipment and furnishings during the progress of the building as is possible before completion of the various parts of the Work, or may occupy portions of the Work before substantial completion of the entire Work, and further agrees that such placing and installing of equipment and furnishings or occupancy of portions of the Work shall not in any way evidence the substantial completion of the entire Work, or signify Owner's acceptance of the Work, nor does it affect claims for liquidated damages in case Substantial Completion is not achieved as required unless the failure to reach Substantial Completion is the result of the early move-in or occupancy. Owner will assume the responsibility for any damages to the Work caused by such occupancy.

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ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract and shall conform to all provisions of the "Manual of Accident Prevention in Construction", published by the Associated General Contractor of America, Inc. latest edition and the Contractor further agrees to fully comply with all safety standards required by the Occupational Safety and Health Administration (:OSHA") 29 USC Section 651 et seq,. and all amendments thereto. However, the Contractor's duties herein shall not relieve any Subcontractor and any other person or entity, including any person or entity required to comply with all applicable federal, state and local laws, rules, regulations, and ordinances, form the obligation to provide for the safety of their employees, persons and property and their requirements to maintain a work environment free of recognized hazards.

§ 10.1.2 Contractor's employees, agents, Subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, shall not perform any service for Owner while under the influence of any amount of alcohol or any controlled substance, or use, posses, distribute, or sell alcoholic beverages while on Owner's premises. No person shall use, possess, distribute, or sell illicit or unprescribed controlled drugs or drug paraphernalia; misuse legitimate prescription drugs; or act in contravention of warnings on medications while performing the Work or on Owner's premises.

§ 10.1.3 Contractor has implemented it's own Safety Manual to assure a drug-free and alcohol-free workplace while on Owner's premises or performing the Work. Contractor will remove any of its employees, agents, subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, from performing the Work any time there is suspicion of alcohol and/or drug use, possession, or impairment involving such person, and at any time an accident occurs where drug or alcohol use could have been a contributing factor, Owner has the right to require Contractor to remove any person from performing the Work any time cause exists to suspect alcohol or drug use. In such cases, the person so removed may only be considered for return to work after the Contractor certifies as a result of a for-cause test, conducted immediately following removal that said person was in compliance with this Contract. Contractor will not use any person to perform the Work who fails or refuses to take, or tests positive on, any alcohol or drug test.

§ 10.1.4 Contractor will comply with all applicable federal, state and local drug and alcohol-related laws and regulations (e.g., Department of Transportation regulations, Drug-Free Workplace Act). Owner has also banned the presence of all weapons on the Project site, whether or not the owner thereof has a permit for a concealed weapon, and the Contractor agrees that the Contractor's representative, employees, agents, and sub-contractors will abide by the same.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards, for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities. The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property

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adjacent to the Project and improvements therein. Any damage to such property for improvements shall be promptly repaired by the Contractor. Contractor shall provide reasonable fall protection safeguards and provide approved fall protection safety equipment for use by all exposed Contractor employees.

§ 10.2.4 When use of storage of hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such under supervision of properly qualified personnel, and shall only conduct such activities after giving reasonable advance written notice of the presence or use of such materials, equipment or methods to Owner and Architect. The storage of explosives on Owner's property is prohibited. The use of explosives materials on Owner's property is prohibited unless expressly approved in advance by authorities having jurisdiction and in writing by Owner and Architect. When use or storage of hazardous materials or equipment or unusual construction methods are necessary, the Contractor shall give the Owner, Program Manager and the Architect reasonable advance notice of the presence or use of such materials, equipment, or methods.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect. Additionally, Contractor shall submit a Safety Plan for the Owner's approval prior to commencing the Work which meets or exceeds the minimum requirements set forth in the provisions of the FBISD Safety Plan. Unless otherwise specified in the Contract Documents, Contractor shall be responsible for initiating, maintaining, supervising, and enforcing all safety precautions and programs in connection with the Work. It shall be the duty and responsibility of the Contractor and all of its Subcontractors to be familiar and comply with all requirements of Public Law 91-596,29 U.S.C. § 651 et. Seq., the Occupational Safety and Health Act of 1970, (OSHA) and all amendments thereto, and to enforce and comply with all the provisions of the Act. Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property to protect them from damage, injury or loss and shall erect and maintain all necessary safeguards for such safety and protection. However, the Contractor's duties shall not relieve any subcontractor(s) or any person or entity (e.g. a supplier) including any person or entity with liability relative to compliance with all applicable federal, state and local laws, rules, regulations, and ordinances which shall include the obligation to provide for the safety of their employees, persons, and property and their requirements to maintain a work environment free of recognized hazards.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.2.9 The performance of the foregoing services by the Contractor shall not relieve the Subcontractors of their responsibilities for the safety of persons and property and for compliance with all applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to the conduct of the Work.

§ 10.2.10 The Contractor shall be responsible for taking all precautions necessary to protect the Work in place from any foreseeable weather conditions which could cause any potential damage to portions or all Work in place. The Contractor shall be responsible for performing all repairs and/or replacement of any Work that results from foreseeable weather conditions.

§ 10.2.11 The Contractor shall promptly report in writing to the Owner, Program Manager and Architect all accidents

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arising out of or in connection with the Work which cause death, personal injury, or property damage, giving full details and statement of any witness. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner, Program Manager and the Architect.

§ 10.2.12 The Contractor shall be responsible for the protection and security of the Work until it receives written notification that the Substantial Completion of the Work has been accepted by the Owner.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing. The Owner, Contractor and Architect shall then proceed in the same manner described in Section 10.3.2.

§ 10.3.1.1 Owner and Contractor may enter into a separate agreement and/or Change Order for Contractor to remediate and/or render harmless the Hazardous Substance, but Contractor shall not be required to remediate and/or render harmless the Hazardous Substance absent such agreement. Contractor shall not be required to resume work in any area affected by the Hazardous Substance until such time as the Hazardous Substance has been remediated and/or rendered harmless.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

(Paragraphs deleted)

§ 10.3.7 As part of the construction contract close out process, and prior to receiving payment of any of the retainage, the Contractor and his subcontractors shall submit notarized statements pertaining to the above referenced hazardous materials.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

The Owner reserves the right to review the insurance requirements during the effective period of any Contract to make reasonable adjustments to insurance coverages and limits when deemed reasonably prudent by Owner based upon changes in statutory laws, court decisions or potential increase in expense to loss.

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(Paragraphs deleted)
§ 11.2 § 11.2.1 § 11.2.2 § 11.2.3 § 11.2.4 § 11.2.5 § 11.2.6 intentionally deleted.
Please refer to Exhibit A to AIA Document A133-2009, Insurance and Bond Requirements.

(Paragraphs deleted)
§ 11.3 The Owner requires that the following insurance requirements be satisfied:

.1 No Work shall be commenced until all insurance requirements set forth in this Agreement have been approved by the Owner in writing.

.2 All insurance policies and certificates required hereunder shall be in form and content satisfactory to the Owner.

.3 The Owner shall be furnished an ACORD form Certificate of Insurance evidencing all policies and endorsements required by this Agreement prior to execution of the Contract and thereafter upon renewal or replacement of each required policy of insurance.

.4 Each Insurance coverage/policy shall contain a provision that at least thirty (30) days prior written notice shall be given to the Owner in the event of cancellation, material change, or non-renewal.

.5 Insurance shall be underwritten by a company licensed to do business in Texas, satisfactory to Owner and rated minimum A-VII by A.M. Best.

.6 The insurance coverages specified herein shall be maintained at all times during the term of the contract and, with the exception of builder's risk coverage, shall be maintained for a minimum of one (1) year thereafter.

.7 No deletions/exclusions from the standard coverage form are allowed without the prior written consent of the Owner.

.8 All insurance except Professional Liability must be issued on an occurrence basis.

.9 The Contractor shall be responsible for all deductibles; the Owner shall approve the deductibles selected.

.10 With the exception of Excess Umbrella Coverage, the coverage afforded by each carrier must be a primary over any other applicable insurance.

.11 In addition to certificates of insurance, copies of policy endorsements must be provided (a) listing the Owner as Additional Insures, and (b) showing waivers of subrogation in favor of the Owner.

§ 11.4 Performance Bond and Payment Bond
§ 11.4.1 The Contractor shall provide a Performance Bond, in the penal sum equal to one hundred percent (100%) of the Contract Sum, if the formal Contract is in excess of One Hundred Thousand Dollars ($100,000.00) and a Labor and Material Payment bond, in the penal sum equal to one hundred percent (100%) of the Contract sum if the formal contract is in excess of Twenty Five Thousand Dollars ($25,000.00).

§ 11.4.2 The Work will not be started until the bonds and issuing companies have been accepted as satisfactory by the Owner. The original bonds will be delivered to the Owner with an attached authorized power of attorney. Such Bonds shall be issued by a company authorized to do business in the State of Texas with an A.M. Best Company rating of a least A-X and included on the U.S. Department of the Treasury Listing of Approved Sureties (Dept. Circular 570).

§ 11.4.3 The Performance Bond Form and the Payment Bond Form included herein shall be executed and submitted to the Architect in duplicate prior to commencement of the work. The surety companies must be acceptable to the Owner and licensed admitted carriers in the State of Texas; and the companies must appear in a current Federal Treasury list as Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds land as Acceptable Reinsuring companies.

§ 11.4.4 Each bond shall be of penal sum equal to one hundred percent (100%) of the Contract Sum and shall be compatible with the provisions of the governing authority. The Contractor shall file copies of each bond with the county clerk and furnish the Owner with a file receipt. The bonds shall remain in force throughout the warranty period of the contract. The Work will not be started until the bonds and issuing companies have been accepted as satisfactory by the Owner. The original bonds will be delivered to the Owner with an authorized power of attorney attached.

§ 11.4.5 Claims must be sent to the Contractor and his Surety in accordance with Article 5160, Revised Civil Statutes. The Owner will furnish in accordance with such Article, a copy of the Payment Bond as provided therein to claimants upon request. All claimants are cautioned that no lien exists on the funds unpaid to the contractor on such Contract, and that reliance on notices sent to the Owner may result in loss of their rights against the Contractor and/or his Surety.

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The Owner is not responsible in any manner to a claimant for collection of unpaid bills, and accepts no responsibility because of any representation by any agent or employee.

§ 11.5 Worker's Compensation Insurance

§ 11.5.1 Comply with the requirements of Rule 28, TAC §110.110, Reporting Requirements for Building or Construction Projects for Governmental Entities

§ 11.5.2 Definitions:

.1 Certificate of coverage ("certificate"). A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing service as on a project, for the duration of the project.

.2 Duration of the project –includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

.3 Persons providing services on the project ("subcontractor" in §406.096)-includes all persons or entities performing all or part of the services the contractor has undertaken to perform on the project, regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity which furnishes persons to provide services on the project. "Services" include without limitation, providing hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply delivery, and delivery of portable toilets.

§ 11.5.3 The Contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the Contractor providing services on the project, for the duration of the project.

§ 11.5.4 The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract.

§ 11.5.5 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

§ 11.5.6 The Contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

.1 A certificate of coverage, prior to that person beginning work on the projects so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project, and

.2 No later than seven days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

§ 11.5.7 The Contractor shall retain all required certificates of coverage for the duration of the project and for one year thereafter.

(Paragraphs deleted)

§ 11.5.8 The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the Contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

§ 11.5.9 The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Worker's Compensation, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack coverage.

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§ 11.5.10 The Contractor shall contractually require each person with whom it contracts to provide services on a project, to:

.1 Provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meet the statutory requirements of Texas Labor code, Section 401.011(44) for all of its employees providing services on the project, for the duration of the project.

.2 Provide the Contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project.

.3 Provide the Contractor, prior to the end of the coverage period shown on the current certificate ends during the duration of the project.

.4 Obtain from each other person with whom it contracts, and provides to the Contractor:

.1 A certificate of coverage, prior to the other person beginning work on the project, and

.2 A new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

.5 Retain all required certificates of coverage on file for the duration of the project and for one year thereafter.

.6 Notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project, and

.7 Contractually require each person with whom it contracts, to perform as required by these subsections (1)-(7), with the certificates of coverage to be provided to the person for whom they are providing services.

§ 11.5.11 By signing this Contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the Contractor who will provide services on the project will be covered by workers compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other actions.

§ 11.5.12 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten days after receipt of notice of breach from the governmental entity.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense. The Owner may make emergency repairs to the Work or take such other measures necessary under the circumstance, if the Contractor does not promptly respond to a Notice of Defect or nonconforming Work.

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Contractor shall be responsible to Owner for this cost if the reason for the repairs is attributable to the Contractor. If payments then or thereafter due to the Contractor are not sufficient to cover such costs, then the Contractor shall pay the difference to the Owner on demand.

§ 12.2.1.1 In the event of failure of a specified project, either during construction or the correction period, the Contractor shall take appropriate measures with the manufacturer of the product to assure correction or replacement of the defective products.

§ 12.2.1.2 Refer to 01 77 00, Closeout Procedures in Division One for further terms regarding warranties which will be required prior to final payment.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 Approximately eleven months after substantial completion, the contractor shall accompany the Owner and Architect on an "end of the one year correction period" reinspection of the Project. Additional deficiencies observed or reported shall be corrected by the Contractor.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

§ 12.3.1 If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

§ 12.3.2 The Owner's use and/or occupancy of any or all of the Project site shall never be construed as an acceptance of Work not in conformance with Contract Documents. The Owner reserves the right to enforce provisions of the Contract unless the Owner's acceptance is provided to the Contractor in writing.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

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§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

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§ 13.7 Equal Opportunity

§ 13.7.1 The contractor shall maintain policies of employment as follows:

.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

§ 13.8 Criminal Background Checks

The Contractor/Subcontractor shall certify the Criminal Background Check, as stated in Fort Bend ISD Board Policy CJA and the form included herein, as required by Texas Education Code Section 22.0834 and Texas Administrative Code Section 153.1101 and 153.1117, and shall comply with all requirements of such laws and policy.

§ 13.9 Required Certifications

Contractor hereby certifies that it is not a company identified on the Texas Comptroller's list of companies known to have contracts with, or provide supplies or services to, a foreign organization designated as a Foreign Terrorist Organization by the U.S. Secretary of State under federal law. Contractor hereby certifies and verifies that neither Contractor, nor any affiliate, subsidiary, or parent company of Contractor, if any (the "Contractor Companies"), boycotts Israel, and contractor agrees that Contractor and Contractor Companies will not boycott Israel during the term of this Agreement. For purposes of this Agreement, the term "boycott" shall mean and include terminating business activities or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory.

Contractor verifies that: (1) it does not, and will not for the duration of the contract, boycott energy companies or (2) the verification required by Section 2274.002 of the Texas Government Code does not apply to the contract.

Contractor verifies that: (1) it does not, and will not for the duration of the contract, have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association or (2) the verification required by Section 2274.002 of the Texas Government Code does not apply to the contract.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

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§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.2.5 The Contractor hereby assigns the Owner any and all claims for overcharges associated with this Contract which arise under the antitrust laws of the United States, 15 U.S.C.A. Section 1 et. Seq. (1973).

§ 14.2.6 If a Performance Bond has been furnished and the Contractor is declared by the Owner to be in default under the Contract, the Surety shall promptly remedy the default by completing the Contract in accordance with its terms and conditions, or by obtaining a bid or bids in accordance with its terms and conditions. At Owner's election, upon determination by the Owner and the Surety of the lowest responsible bidder, the Surety will complete the Work or will arrange for a Contract between such bidder and the Owner, and make available as Work progresses sufficient funds to pay the cost of completion less the balance of the Contract Sum, but not exceeding the Penal Sum of the bond and other costs and damages for which the Surety may be liable under the bond. The phrase 'balance of the Contract Sum' as used herein shall mean the total amount payable by the Owner to the Contractor under the Contract and amendments thereto less the amount previously paid by the Owner to the Contractor.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

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.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In the case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed up to date of receipt of the notice of termination, plus costs of demobilization.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within ninety (90) days after occurrence of the event giving rise to such Claim or within ninety (90) days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Contractor agrees that this is a reasonable Notice requirement. Any Claim or portion of a Claim that has not been made the specific subject of a Notice strictly in accordance with the requirements of this section is waived.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

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§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 No extensions of the Contract Time will be granted for inclement weather, except as stated in Section 8.3.1.

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(Paragraphs deleted)

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those arising under Sections 11.3.9 and 11.3.10, or claims alleging an error or omission by the Architect, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. If the parties are unable to agree, any claim, dispute or matters arising out of the contract between the Architect, Owner and Contractor or any combination of those parties shall be submitted to a court of appropriate jurisdiction.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefore; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties, but subject to mediation, if both parties so agree, and subject to legal or equitable proceedings in a court having jurisdiction thereof. It is understood and agreed that, in the event that any dispute, controversy, or conflict arises during the design and construction of the Project or following its completion, the parties hereto will cooperate in good faith, if possible, to resolve the issues without resorting to litigation.

(Paragraphs deleted)

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§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

(Paragraph deleted)

§ 15.2.9 The prevailing party in any judicial proceeding arising from the Contract Documents shall recover its reasonable and necessary attorneys' fees.

§ 15.3 Mediation

(Paragraph deleted)

§ 15.3.2 The parties may mutually agree to resolve their claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the Contract. Mediation shall proceed in advance of legal or equitable proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing unless stayed for a longer period of agreement of the parties or court order.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

(Paragraphs deleted)

ARTICLE 16 Contractor Accounts, Records, and Inspection

Contractor shall at all times maintain job records, including, but not limited to, invoices, payment records, payroll records, daily reports, logs, diaries, and job meeting minutes, applicable to the project. Contractor shall make such reports and records available to inspection by the Owner, Architect, or their respective agents, within five (5) working days of request by Owner, Architect, or the respective agents. Job Records must be retained by Contractor for at least seven (7) years after the date of Final Completion of the Project. Furthermore, the Contractor shall promptly provide copies, including by electronic means, of all documents that may be required by the State Public Information Act.

ARTICLE 17 Business Ethics

§ 17.1 During the course of pursuing contracts, and the course of Contract performance, Contractor and its Subcontractors and vendors will maintain business ethics standards aimed at avoiding real or apparent impropriety or conflicts of interest. No substantial gifts, entertainment, payments, loans or other considerations beyond that which would be collectively categorized as incidental shall be made to any personnel of the Owner, its Program Managers, or its Architects, or to family members of any of them. At any time Contractor believes there may have been a violation of this obligation, Contractor shall notify Owner of the possible violation. Owner is entitled to request a representation letter from Contractor, its Subcontractors or vendors at any time to disclose all things of value passing from Contractor, its Subcontractors or vendors to Owner's personnel, its Program Managers and its Architects.

§ 17.2 The Owner may, by written notice to the Contractor, cancel the Contract for Construction without liability to the Contractor if it is determined by the Owner that gratuities, in the form of entertainment, gifts, or anything of monetary value, were offered or given by the Contractor, or any agent, or representative of the Contractor, to any officer or employee of the Fort Bend Independent School District with a view toward securing a contract or securing favorable treatment with respect to the awarding, amending, or making of any determinations with the respect to the performing of such a contract. In the event the Construction Agreement is cancelled by the Owner pursuant to this provision, Owner shall be entitled, in addition to any other rights and remedies, to recover or withhold the amount of the cost incurred by the Contractor in providing such gratuities.

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General Conditions of the Contract for Construction

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PAGE 1

(Name, legal status and address)

Fort Bend Independent School District
16431 Lexington Boulevard
Sugar Land, Texas 77479

PAGE 10

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Performance Bond, Labor and Material Payment Bond, Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the ~~Agreement,~~ Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change ~~Directive,~~ Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to ~~bid, Instructions to Bidders,~~ propose, instructions to Proposers, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's ~~bid or proposal,~~ Proposal or portions of Addenda relating to ~~bidding or proposal requirements.~~proposal requirements).

...

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project. It also includes all supplies, skill, supervision, transportation services and other facilities and things necessary, proper or incidental to the carrying out and completion of the terms of the contract and all other items of cost or value needed to produce, construct and fully complete the public work identified by the Contract Documents. Nothing in these Conditions shall be interpreted as imposing on either the Owner or the Architect, or their respective agents, employees, officers, directors or consultants, any duty, obligation or authority with respect to any items that are not intended to be incorporated into the completed Project, or that do not comprise the Work, including, without limitation, shoring, scaffolding, hoists, weatherproofing, or any temporary facility or activity, since these are the sole responsibility of the Contractor.

PAGE 11

§ 1.2.1.2 Precedence of the Contract Documents: The most recently issued Document takes precedence over previous issues of the same Document. The order of precedence is as follows with the highest authority listed as "1".

.1 Contract Modifications (such as Change Orders) signed by the Contractor and Owner.
.2 The Agreement. (AIA Document A101-2017)
.
.3 The General Conditions of the Contract for Construction
.4 Addenda, with those of later date having precedence over those of earlier date

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.5 Drawings and Specifications

Should these Documents disagree in themselves, the Architect and Owner will select the appropriate method for performing the Work, to facilitating avoiding increase in the Contract cost. If an item is shown one place in the Drawings, but no another, or called for in a schedule or the specifications but not shown on the Drawings, or shown on the Drawings but not in a schedule, it is to be included. Existing conditions take precedence over Drawings and Specifications for dimensions.

§ 1.2.1.3 Relation of Specifications and Drawings: To be equivalent in authority and priority. Should they disagree in themselves, or with each other, prices shall be based on the most expensive combination of quality and quantity of Work indicated. In the event of the above mentioned disagreements, the resolution shall be determined by the Architect and Owner.

...

§ 1.2.4 In the case of inconsistency within or between the Drawings and Specifications discovered prior to Proposal Submission Time but too late to be clarified by an Addendum, the better quality or greater quantity of Work shall be included in the Proposal. Clarification of any inconsistency will be accomplished with the Contractor after award of Contract and, if necessary, an appropriate reduction in the Contract will be accomplished by Change Order.

§ 1.2.5 Product and Reference Standards. When specific products, systems or items of equipment are referred to in the Contract Documents, any ancillary devices which the Contractor knows, or in accordance with the standard of care for a Contractor should have known, is necessary for proper functioning shall also be provided. When standards, codes, manufacturer's instructions and guarantees are required and no edition is specified by the Contract Documents, the current edition at the time of Contract execution shall apply whether or not the proper edition was set out in the Contract Documents. References to standards, codes, manufacturer's instructions and guarantees shall apply in full, except:

.1 They do not supersede more stringent standards set out in the Contract Documents, and

.2 any exclusions or waivers that are inconsistent with the Contract Documents do not apply.

§ 1.2.6 Relations of Specifications and Drawings. General Requirements in the Specifications govern the execution of all Work. Summary paragraphs present a brief indication of the Work, but do not limit the Work as later detailed. Should the Drawings and Specifications have internal inconsistencies, then the Contractor shall base the bids and construction on the most expensive combination of quality and quantity of work indicated. For purposes of construction, the Architect shall determine the appropriate Work, after the Contractor brings the inconsistency to the Architect's attention. Failure to report an inconsistency shall be evidence that Contractor has elected to proceed in the more expensive manner.

PAGE 12

§ 1.6.1 ~~Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and~~ Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer at the corporation for which is was intended, or if delivered at or sent by certified mail, or by registered or certified mail, or by courier service providing proof of delivery, to the last business address known to the party giving notice, or if delivered by facsimile or other electronic communications to the offices of the person or corporation for which it was intended. For facsimiles or other electronic communications received after 5:00 p.m. on a business day, or on a weekend or legal holiday on which the recipient's offices are closed, notice shall be deemed to have been duly served ~~if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.~~on the next business day.

~~**§ 1.6.2** Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.~~

PAGE 13

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§1.9 Miscellaneous Other Definitions

§1.9.1 Addenda, Addendum. Documents issued by the Architect prior to execution of the Owner Contractor Agreement for this Project that modify or clarify the Proposal Documents. All addenda become a part of the Contract Documents.

§1.9.2 Alternate Proposal(s). A separate amount stated on a separate Proposal Form which, if accepted by the Owner, will be added to or deducted from the Base Proposal. If accepted, the work that corresponds to the alternate proposal will become part of the agreement between Owner and Contractor. Alternate proposals shall remain valid for the same period of time as the Base Proposal after receipt of proposals, regardless if an Owner Contractor Agreement has been executed, unless indicated otherwise herein.

§1.9.3 Approved, Approved Equivalent, Approved Equal, or Equal. The terms Approved, Approved Equivalent, Approved Equal, and Or Equal, relate to the substitution of products or systems approved in writing by the Architect. Refer to Paragraph 3.4.2, Substitution of Products and Systems, for procedures which must be followed after award of contract. The substitution procedure process to be followed prior to receipt of proposals is described in the Instructions to Bidders.

§1.9.4 Base Proposal. The Contractor's proposal for the Work, not including any Alternates.

§1.9.5 Contract Time. The period of time which is established in the Contract Documents for Substantial Completion of the Work. This period of time is subject to authorized adjustments as enumerated in the Contract Documents.

§1.9.6 Date of Agreement. The date the Owner formally awards a Contract for Construction of the Work. This date will be inserted in the first page of the Agreement between Owner and Contractor and shall be referenced in Performance Bond and Payment Bond forms. See also Date of Commencement of Work.

§1.9.7 Date of Commencement of the Work. The date of a written Notice to Proceed to the Contractor for a given portion of the Work. This date constitutes day zero (0) of the stated Contract Time. The Notice to Proceed will be issued after the District has received and validated the Contractor's Payment Bond, Performance Bond and Insurance.

§1.9.8 Date of Final Completion. The end of construction. See AIA Document A201, Section 9.10.

§1.9.9 Day. The following days are referenced in the documents:

.1 **Calendar Days**: The Contract Time is established in Calendar Days and extensions of time granted for Regular Work Days lost, if any, will be converted to Calendar Days.

.2 **Holidays:** The days officially recognized by the construction industry in this area as a holiday; normally limited to the observance days of New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and the day after and Christmas Day.

.3 **Regular Work Days:** All calendar days except holidays, Saturdays, and Sundays. Requests for extensions of time shall be requested on the basis of Regular Work Days, and those days, if approved, will be converted to calendar days by multiplying by a factor of one and four-tenths (1.4).

.4 **No extensions of the Contract Time will be granted due to inclement weather except as stated in Section 8.3.1.**

§ 1.9.10 Final Completion. Achieved after the Work has been completed by the Contractor, the final inspection has been performed by the Architect and the Owner, the Contract Closeout process has been completed, and the final Certificate for Payment has been issued by the Architect to the Owner. See Sections 1.1.14 and 9.10 and Specification sections regarding Contract Close Out.

§1.9.11 Notice to Proceed. A notice that may be given by the Owner to the Contractor that directs the Contractor to start the Work. It may also establish the Date of Commencement of the Work.

§ 1.9.12 The Project Manual. A volume assembled for the Work which may include the Proposal requirements, sample forms, Conditions of the Contract, Drawings and Specifications.

§ 1. 9.13 Proposal. A complete and properly signed proposal to do the Work for the sums stipulated therein, submitted

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on the prescribed forms in accordance with the Proposal Documents.

§ 1.9.14 Proposal Documents. All documents and bound into or referenced in the Project Manual, the Drawings, and Addenda related thereto. The Project Manual contains the Proposal requirements, Contract and other forms, Conditions of the Contract, the Specifications, and a list of Drawings and Schedules, some of which are bound into the Project Manual (other Drawings and Specifications are bound separately).

§ 1.9.15 Proposer. A person or entity who submits a Proposal.

§1.9.16 Provide. Whenever the word "provide" is used in these documents, it shall mean the same as "furnish and install".

§1.9.17 Punch List. A comprehensive list prepared by the Contractor prior to Substantial Completion to establish all items to be completed or corrected; this list may be supplemented by the Architect or Owner. See AIA Document A201, Section 9.8.

§ 1.9.18 SMALL BUSINESS ENTERPRISE PROGRAM ("SBEP"). Owner has adopted the SBEP to provide increased business opportunities for locally certified small businesses to competitively participate in contracting and procurement within FBISD. *See* FBISD Board Policy CV(Local).

§ 1.9.19 SUB-PROPOSER. A person or entity who submits a Proposal to a Proposer for materials, equipment or labor for a portion of the Work.

§1.9.20 Unit Prices. A cost for a unit of work as described in the Contract Documents. The Owner may add or deduct Unit Price work at the amounts stated on the Proposal Form and such amounts shall not be subject to additional mark up by the Contractor or his subcontractors."

PAGE 14

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. ~~The Owner shall designate in writing a representative who shall have express~~ All parties understand that only the Board of Trustees for the Owner acting as a body corporate has the authority to bind the Owner with respect to all matters requiring the ~~Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority.~~ Board's approval under current policy of the Board of Trustees for the Owner, including, but not limited to, Change Orders. Except as otherwise provided in Section 4.2.1, the Architect does not have authority to bind the Owner with respect to matters requiring the Owner's approval or authorization. The term "Owner" means the Owner or the Owner's authorized representative.

~~**§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.**~~

§ 2.1.2 The Board of Trustees, by majority vote, is the only representative of the Owner, an independent school district, having the power to enter into a contract, to approve a Change Order requiring an increase in the Contract Sum, or agree to an extension to the contractual Completion Date, unless this authority is lawfully delegated. Neither Architect nor Contractor may reply upon the direction of any employee of Owner or Program Manager who has not been designated in writing by the Superintendent of Schools or Board of Trustees of Owner; Owner shall not be financially responsible for actions taken by the Architect or Contractor in reliance upon direction from unauthorized persons.

§ 2.1.3 The presence of the Owner, Program Manager or Architect at the Work site does not imply acceptance or approval of the Work.

§ 2.1.4 The Owner, being a public body under the laws of the State of Texas, must have funds in the full amount of the Contract on hand prior to award and execution of the Contract. Furthermore, no Contract exists between the Owner and the Contractor until the formation of the Contract is approved by a majority of the Board of Trustees of the Owner in open session at a duly held Board meeting, and the contract is signed by an authorized Owner's representative.

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§ 2.1.5 At any time prior to the Owner's receipt of the executed Agreement with the required bonds and insurance, the Owner may, at its sole option and without cause, reject the offer described in this Agreement by delivering to the Contractor a written notice stating so. Such notice shall be signed by the Owner's Director of Purchasing or designee, and shall be effective on receipt by the Contractor. The rejection of the offer described in this Agreement, shall cause no obligation or duty to the Owner save return of bid or proposal security, if any, if rejection is without cause. This section does not pertain to rejection for cause by the Owner, or for the Contractor's failure to provide require bonds or insurance.

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. ~~The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.~~

~~**§ 2.2.2** Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.~~

~~**§ 2.2.3** After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.~~

PAGE 15

§ 2.3.6 ~~Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.~~The Contractor shall pay the cost of reproduction, postage, and handling of all sets of Drawings and Specifications necessary for the Contractor to execute the Work. If the Contractor requests in writing that the Architect and his Consultants update the original Drawings and Specifications to incorporate Addendum items, or Modifications, the Architect and his Consultants will do so at their expense. However, the Contractor shall pay the cost of reproduction, postage and handling of all sets of Drawings and Specifications necessary for the Contractor to execute the Work.

...

If the Contractor defaults or neglects to carry out the ~~Work~~ work in accordance with the Contract Documents and ~~fails within a ten-day period~~ fails, after receipt of written notice from the ~~Owner~~ Owner, to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such ~~default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable~~ deficiencies. In such case, an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the actual cost of correcting such deficiencies, including the Owner's expenses and compensation for the ~~Architect's additional services made necessary by such default, neglect, or failure. If current and future payments~~ Architect, Program Manager and other consultants' additional services and expenses made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to the prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the ~~Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.~~Owner within thirty (30) days of receipt of written notice from the Owner therefor.

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§ 2.5.1 After the Work is complete the Owner may make emergency repairs to the Work if necessary to prevent further damage, or if the Contractor does not promptly respond to a notice of a condition requiring repairs. Contractor shall be responsible to Owner for this cost if the reason for the repairs is defects in Contractor's Work. If payments then or thereafter due the Contractor are not sufficient to cover such costs, the Contractor shall pay the difference to the Owner

§ 2.7 Owner's Right to Occupy the Project

§ 2.7.1 The Owner shall have the right to occupy or use without prejudice to the right of either party, any completed or largely completed portions of the project, notwithstanding the time for completing the entire work or such portions may not yet have expired. Such occupancy and use shall not constitute acceptance of any work not in accordance with the Contract Documents. If the Contractor determines that said occupancy may cause a delay to the completion of the project, he shall notify the Owner in writing immediately.

§ 2.7.2 Refer to Article 11 Insurance and Bonds regarding property insurance requirements in the event of such occupancy.

§ 2.7.3 If Contractor has not completed the obligations of the Contract Documents by the dates established by subsequent Amendments to the Agreement Between Owner and Construction Manager, the Owner shall have the right to occupy or use the entire project.

PAGE 16

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect or Program Manager in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.1.4 The Contractor must be fully qualified under any state or local licensing laws for Contractors in effect at the time and at the location of the work. The Contractor is responsible for determining that all of his subcontractors and prospective subcontractors are duly licensed in accordance with the law.

PAGE 17

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or ~~Architect~~ architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public ~~authorities.~~authorities provided such errors, inconsistencies, omissions, differences, or nonconformities could not have been ascertained from a careful study of the Contract Documents.

§ 3.2.5 The Contractor shall make a reasonable attempt to interpret the Contract Documents before asking the Architect for assistance in interpretation or initiating a Request for Information (RFI). The Contractor shall not ask the Architect for observation of work prior to the Contractor's field superintendent's personal inspection of the work and his determination that the work complies with the Contract Documents. The Contractor shall arrange meetings for the Architect, prior to commencement of the Work, with all major subcontractors, to allow the subcontractor to demonstrate his understanding of the documents to the Architect and to allow the subcontractor to ask for any interpretation he may require. Any design errors or omissions noted by the Contractor during this review shall be reported promptly to the Architect, but it is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional unless otherwise specifically provided in the Contract Documents.

§ 3.2.6 If, in the opinion of the Architect and the Program Manager, the Contractor does not make a reasonable effort to comply with the above requirements of the Contract Documents and this causes the Architect or his Consultants to

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expend an unreasonable amount of time in the discharge of the duties imposed on him by the Contract Documents, then the Contractor shall bear the cost of compensation for the Architect's additional services made necessary by such failure. The Architect will give the Contractor prior notice of intent to bill for additional services related to Sections 3.2.5, 3.2.6 and 3.7 before additional services are performed.

§ 3.2.7 If the Contractor has knowledge that any of the products or systems specified will perform in a manner that will limit the Contractor's ability to satisfactorily perform the work or to honor his Warranty, he shall promptly notify the Architect in writing, providing substantiation for his position. Any necessary changes, including substitutions of materials, shall be accomplished by appropriate Modification. If the Contractor fails to perform the obligations of Section 3.2.1 and 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations.

§ 3.2.8 Prior to performing any Work, and only if applicable, Contractor shall locate all utility lines as shown and located on the plans and specifications, including telephone company lines and cables, sewer lines, water pipes, gas lines, electrical lines, including, but not limited to, all buried pipelines and buried telephone cables, and shall perform any Work in such a manner so as to avoid damaging any such lines, cables, pipes, and pipelines. In addition, Contractor shall independently determine the location of same. Contractor shall be responsible for any damage done to such utility lines, cables, pipes and pipelines during its construction work, and shall be responsible for any loss, damage, or extra expense resulting from such damage. The Contractor and each Subcontractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including

.1 the location, condition, layout and nature of the Project site and surrounding areas;
.2 generally prevailing climatic conditions;
.3 anticipated labor supply and costs;
.4 availability and cost of materials, tools and equipment; and
.5 other similar issues.

§ 3.2.9 Contractor shall be responsible for any damage done to such lines, cables, pipes and pipelines during its construction work resulting from its negligent conduct

PAGE 18

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines ~~that~~ such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely ~~notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.~~ written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any resulting loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures, but only to the extent the Owner would be responsible for any such losses or damages under state and/or federal law.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors. . It is understood and agreed that the relationship of Contractor to Owner shall be that of an independent Contractor. Nothing contained herein or inferable here from shall be deemed or construed to (1) make Contractor the agent, servant or employee of the Owner, or (2) to create any partnership, joint venture, or other association between Owner and Contractor. Any direction or instruction by Owner or any of its authorized representatives in respect to the Work shall relate to the results the Owner desires to obtain from the Work, and shall in no way affect Contractor's independent Contractor status described herein. As part of that responsibility, Contractor shall enforce the Owner's alcohol-free, drug-free, tobacco-free, harassment-free and weapon-free policies and zones, which will require compliance with those policies and zones by Contractors'

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employees, subcontractors, and all other persons carrying out the Contract. Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's subcontractors, while on Owner's property, to refrain from committing any criminal conduct, using tobacco products, possessing or drinking alcoholic beverages, possessing or using illegal drugs or any controlled substance, carrying weapons, speaking profane and/or offensive language, or engaging in any inappropriate interactions of any nature whatsoever with students, and teachers, staff and visitors, including talking, touching, staring or otherwise contributing to a hostile or offensive environment for Owner's students and staff. All areas of campus, other than the defined construction area, shall be off limits to Contractor's forces, unless their work assignment specifies otherwise. Contractor shall also require adequate and appropriate dress and identification of Contractor's employees, subcontractors, and all other persons carrying out the Work. The Contractor shall further ensure that no on-site fraternization shall occur between personnel under the Contractor's and Subcontractor's direct or indirect supervision and Owner's students or employees and the general public. Failure of an individual to adhere to these standards of conduct shall result in the immediate termination of the employment of the offending employee from all construction on any of Owner's property and immediate removal from the site.

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§ 3.3.4 The Contractor is especially cautioned to coordinate the routing of mechanical and electrical items prior to commencing these operations.

§ 3.3.5 Contractor shall bear sole responsibilities for design and execution of acceptable trenching and shoring procedures, in accordance with Texas Government Code, Section 2166.303 and Texas Health and Safety Code, Subchapter C, Sections 756.021, et seq. On trench excavations in excess of 5 feet in depth, Contractor shall pay a qualified engineer, experienced in the engineering design and preparation of drawings and specifications for compliance with state requirements for trenching and shoring, to prepare and professionally seal detailed drawings and specifications directing Contractor in the safe execution of trenching and shoring.

§ 3.3.6 Any time that the Contractors' employees, subcontractors and their agents and employees, and other persons or entities performing portions of the work for or on behalf of the Contractor or any of its subcontractors are on site, the work shall be supervised by a qualified employee of the Contractor.

§ 3.3.7 The Contractor shall review Subcontractor safety programs, procedures, and precautions in connection with performance of the Work. However, the Contractor's duties shall not relieve any Subcontractor(s) or any other person or entity (e.g., a supplier), including any person or entity with whom the Contractor does not have a contractual relationship, of their responsibility or liability relative to compliance with all applicable federal, state, and local laws, rules, regulations, and ordinances which shall include the obligation to provide for the safety of their employees, persons, and property and their requirements to maintain a work environment free of recognized hazards. The foregoing notwithstanding, the requirements of this Section are not intended to impose upon the Contractor any additional obligations that the Contractor would not have under any applicable state or federal laws, including, but not limited to, any rules, regulations, or statutes pertaining to the Occupational Safety and Health Administration

PAGE 19

§ 3.4.2 ~~Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.~~The materials, products, and the systems covered by these specifications have been selected as a standard because of quality, particular suitability, or record of satisfactory performance. It is not intended to preclude the use of equivalent or better materials, products, or systems provided that same meets the requirements of the particular project and have been approved in an addendum as a substitution prior to the submission of bids. If prior written approval in an addendum has not been obtained, it will be assumed that the Bid is based upon the materials, products, and systems described in the Bidding Documents and no substitutions will be permitted, except as provided hereinafter.

.1 If, after award of contract, the Contractor of one of his Subcontractors, or Suppliers determines that any of the products or systems specified will perform in a manner that will limit the Contractor's ability to satisfactorily perform the work or to honor the Warranty, the Contractor shall promptly notify the Architect, in writing, providing detailed substantiation for his position. Any changes deemed necessary

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by the Owner and Architect, including substitution of materials and change in Contract Sum, either upward or downward, if any, shall be accompanied by appropriate Modification.

.2 After the Contract has been executed, the Owner and Architect will consider a formal request for the substitution of products on the Work in place of those specified only under the conditions set forth in specification referring to Product Options and Substitutions.

.3 Requests for substitution, received by the Architect later than forty five (45) days after "Notice to Proceed" or "Date of Commencement of the Work" (whichever occurs first), may result in additional costs to the Owner. Contractor agrees to reimburse the Owner through deductive Change Order to the Contract, for all costs associated with such requests.

.4 By making request for substitutions based on Subparagraph 3.4.2 above, the Contractor

.1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equivalent or superior in all respects to that specified, and is suitable for the intended purpose;

.2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;

.3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and

.4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

.5 Substitution requests shall be submitted on the forms included herein and in accordance with the process established in specification referring to Product Options and Substitutions.

PAGE 20

.1 State law prohibits possession and/or use of alcohol and tobacco products on school property at all times.

.2 State law prohibits weapons or firearms on school property.

.3 There shall be zero tolerance for fraternization with students, teachers and any other school district personnel, Contractor will immediately remove any employee that violates this provision from the project.

.4 No glass bottles shall be brought on the construction site or Owner's property by any construction personnel.

.5 Background checks

Contractor must give advance notice to the Owner if the person or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony. The Owner may terminate this Agreement pursuant to Article 14 Termination if the Owner determines that the person or business entity failed to give notice as required by this section or misrepresented the conduct resulting in the conviction. This section requiring advance notice does not apply to a publicly held corporation. THE CONTRACTOR RELASES, INDEMNIFIES AND HOLDS HARMLESS THE OWNER FOR CONTRACTOR'S FORCES' NON-COMPLIANCE WITH OWNER'S DRUG-FREE, ALCOHOL-FREE, WEAPON-FREE, HARASSMENT-FREE, AND TOBACCO-FREE ZONES OR CONTRACTOR'S FORCES' NON-COMPLIANCE WITH CRIMINAL LAW.

§ 3.4.4 The Contractor shall disclose the existence and extent of any financial interests, whether director indirect, such Contractor may have in any Subcontractor or material supplier which the Contractor may propose for this Project.

...

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and ~~new~~ new, unless the Contract Documents require or permit otherwise. The ~~Contractor~~ contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of ~~the~~ Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect ~~caused~~ cause by abuse, ~~alterations~~ material alteration to the Work not executed by the Contractor, ~~improper or insufficient maintenance, improper operation,~~ insufficient maintenance or maintenance not in compliance with written instructions therefor, operation not in compliance with written instructions therefor, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall

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furnish satisfactory evidence as to the kind and quality of materials and equipment. The warranties set out in this section are not exclusive of any other warranties or guarantees set out in other places in the Contract Documents or implied under applicable law.

...

§ 3.5.3 In the event of failure in the Work, including a specified product, whether during construction, or the correction period (which shall be one (1) year from the Date of Substantial Completion, except where a longer period as specified), the Contractor shall take prompt and appropriate measures to assure correction or replacement of the defective Work or any portion thereof, including manufactured products, whether notified by the Owner or the Architect. Upon correction of warranty items, the Contractor shall provide the Owner and Architect with written notification of said correction. This obligation shall survive acceptance of the Work under the Construction Contract.

§ 3.5.4 The Contractual Correction Period for this Project is one (1) year from the date of Substantial Completion, except for any extended warranties as specified within the Contract Documents. Items of Work not completed until after the deadline for Substantial Completions shall have their warranties (general and any extended warranty periods) extended by the period of time between the deadline for Substantial Completion and the actual completion of the Work. Such warranties shall be submitted to the Owner in writing, documenting such time extensions. This correction period shall not restrict or modify extended warranties called for or provided on systems, equipment or other specific portions of the Work.

§ 3.5.5 The Contractor shall accompany the Owner and Architect for a complete reinspection of the Project approximately eleven (11) months after the Date of Substantial Completion and shall promptly complete any observed or reported deficiencies in the Work, including any uncompleted Punch List items or outstanding and incomplete warranty items. The contractor shall provide written notification to the Owner and Architect when said Punch List items and/or additional deficiencies observed have been corrected. This obligation shall survive acceptance of the Work under the Construction Contract.

§ 3.5.6 Contractor shall certify that the Project has been constructed in conformance with the Architect's or Engineer's plan, specifications, and Contract Documents, as modified from time to time pursuant to the terms of the Contract Documents. Contractor shall fully complete a "Certification of Project Completion" as required by 19 Texas Administrative Code Section 61.1036(c) (3) (F). The Contractor shall deliver to the Owner its written guarantee, in the form attached to this contract as Exhibit "F", guaranteeing all of the work under the contract to be free from faulty materials in every particular, and free from improper workmanship, and against injury except from proper and usual wear and tear; and agreeing to replace or re-execute without cost to the Owner such work as may be found to be improper, imperfect or of unsatisfactory material and/or workmanship, without cost to the Owner, and to make good all damage caused to other work or materials, or to the Owner's property, real and personal, due to such improper, imperfect or faulty material and/or workmanship, and/or due to the required replacement or re-execution. Such warranty periods shall be maintained notwithstanding that certain systems may be activated prior to Substantial Completion as required for the satisfactory completion of the project. This guarantee shall be made to cover a period of one (1) year from the date of Substantial Completion as certified by the Architect under this Contract. This guarantee must be furnished to the Owner and approved by it before acceptance and final payment is made.

Upon written notice from the Owner, the Contractor shall promptly remedy defects as covered by his guarantee. If Contractor does not respond to Owner's written notice, either by beginning corrective work or notifying the Owner in writing stating when work will begin, within ten (10) days of receipt, the Owner may take measures to correct the work himself and Contractor will be obligated to reimburse Owner's costs. If notice of defects covered by warranty is given in writing to the Contractor on a timely basis, the obligation to provide the warranty work may extend beyond the one year warranty period until the warranty defect is remedied and accepted by the Owner. The Contractor shall provide bond coverage to extend for the one (1) year period of the guarantee to insure performance under the terms of his obligation. The provisions of this section shall be in addition to, and not in lieu of, any other rights and remedies available to the Owner.

§ 3.5.6.1 All required warranties on equipment, machinery, materials, or components shall be submitted to the Architect and Program Manager on the manufacturer's or supplier's approved forms at the time of Substantial Completion.

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§ 3.5.6.2 When deemed necessary by the Owner and prior to installation of any item specifically made subject to a performance standard or regulatory agency standard under any provision of the Contract Documents, Contractor shall furnish proof of conformance to the Architect. Proof of conformance shall be in the form of

.1 an affidavit from the manufacturer certifying that the item is in conformance with the applicable standard, or

.2 an affidavit from a testing laboratory certifying that the product has been tested within the past year and is in conformance with the applicable standard, or

.3 such further reasonable proof as is required by the Architect.

§ 3.5.7 The warranties of Contractor provided in Sections 3.5.2 and 3.5.3 shall in no way limit or abridge the warranties of the suppliers of equipment and systems which are to comprise a portion of the Work and all of such warranties shall be in form and substance as required by the Contract Documents. Contractor shall take no action or fail to act in any way which results in the termination or expiration of such third party warranties or which otherwise results in prejudice to the rights of Owner under such warranties. Contractor agrees to provide all notices required for the effectiveness of such warranties and shall include provisions in the contracts with the providers and manufacturers of such systems and equipment whereby Owner shall have a direct right, but not a duty, of enforcement of such warranty obligations.

§ 3.5.8 Contractor and Owner acknowledge that the Project may involve construction work on more than one school building for the Owner. Each building, or approved phase of each building, shall have its own, separate, and independent date of substantial completion or final completion. Contractor shall maintain a complete and accurate schedule of the dates of substantial completion, dates upon which the one-year warranty on each phase or building, which is substantially complete, will expire, and dates of final completion. If Owner, Architect or Program Manager discovers during the warranty period, deficiencies not previously reported, Contractor shall accompany the Owner, Architect and Program Manager on an inspection of such deficiencies and Contractor shall be responsible for correcting any such deficiencies not caused by the Owner or the use of the building. For extended warranties required by various sections, i.e. roofing, compressors, mechanical equipment, Owner will notify the Contractor of deficiencies and Contractor shall start remedying these defects within fifteen (15) days of initial notification from Owner. Contractor shall prosecute the work without interruption until accepted by the Owner and the Architect, even though such prosecution should extend beyond the limit of the warranty period

The ~~Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.~~Owner qualifies for exemption from State and Local Sales and Use Taxes pursuant to the provision of Article 20.04(f) of the Texas Limited Sales, Excise and Use Tax Act. Taxes normally levied on the purchase, rental and lease of materials, supplies and equipment used or consumed in performance of the Contract may be exempted by issuing to suppliers an exemption certificate in lieu of tax. Exemption certificates comply with State Comptroller of Public Accounts Ruling No. 95-0.07. Any such exemption certificate issued in lieu of tax shall be subject to State Comptroller of Public Accounts Ruling No. 95-0.09, as amended. Failure by the Contractor or Subcontractors to take advantage of the Owner's exemption and to obtain such exemption certificate shall make him responsible for paying taxes incurred on materials furnished on the Project without additional cost to or reimbursement by the Owner.

PAGE 22

.1 The Owner shall pay directly to the governing authority the cost of all permanent property utility assessments and similar utility connection charges.

.2 The Contractor shall pay directly all temporary utility charges (excluding permanent power), utility district/company inspection fees, temporary tap charges, and temporary water meter charges and any other similar fees assessed by jurisdictional authority having control over this Project. The Contractor shall secure and pay for all governing authorities' permit fees.

.3 Fees payable to the Texas Department of Licensing and Regulation (TDLR) for document review relative to the Elimination of Architectural Barriers Act shall be paid by the Owner and the Architect will submit the documents to the TDLR for review and approval.

.4 SWPPP

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.5 The Contractor shall include in his base Proposal the permit fee required by Harris County. The Owner will be responsible for fees payable to the TDLR, any MUD and the Third-party plan reviewer.

PAGE 23

§ 3.7.6 The Contractor shall comply with the provisions of Section 22.0834 of the Texas Education Code and Section 153.1117 of the Texas Administrative Code. The form of certification by the Contractor shall be supplied by the Owner, and must be supplemented by the Contractor as required by law, or as requested by the Owner.

§ 3.7.7 The Contractor shall be responsible for timely notification to and coordination with all utility companies regarding the provision of or revising of services to the Project. The Contractor shall inform the Architect and Program Manager at once when the Owner's participation is required. Connections for temporary and permanent utilities and payment for temporary utilities services required for the Work, whether the Work is new construction or renovation of an existing facility, are the responsibility of the Contractor unless otherwise agreed. If the Work is new construction, payment for permanent utility services shall be the responsibility of the Contractor until Substantial Completion.

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract ~~Documents.~~ documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may ~~direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.~~direct and approve in writing. All unused allowance amounts shall be credited back to Owner. No markup shall be allowed for the Contractor on any expenditures from Allowances or Contingency funds included in the Contract Sum.

...

§ 3.9.1 The Contractor shall employ a competent ~~superintendent~~ superintendent, project manager and necessary assistants who shall be in attendance at the Project site during performance of the ~~Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as~~ Work, including Punch List work. The superintendent and project manager shall represent the Contractor, and unless provided otherwise in Section 3.1.1, communications given to the superintendent or project manager shall be binding as if given to the Contractor.

PAGE 24

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed. In the event a substitution of superintendent is necessary, the Contractor shall reimburse the Owner, Architect and his Consultants (on a reasonable hourly basis) for additional costs incurred due to said substitution. No increase in Contract Time or Contract Sum shall be allowed in the event the Owner or Architect objects to any nominated superintendent. The superintendent must be at the construction site acting in his supervisory capacity at all times when construction is in progress. A separate full-time superintendent will be required for each school site.

...

§ 3.10.1 ~~The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and~~ Within 30 days of being awarded an Amendment, the Contractor shall prepare and submit for the Owner and Architect's review, a construction schedule for the Work, with critical path clearly defined. The schedule shall not exceed time limits current under the Contract Documents. ~~The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.~~For further schedule requirements refer to specification section regarding project schedules in the Project Manual.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not

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be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals. Requirements for the submittal schedule are outlined in specification section 01 32 16, Construction Progress Schedules. If the Contractor fails to submit a submittal schedule or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in the Contract Sum or extension of the Contract Time based on the time required for review of submittals.

...

§ 3.10.4 The Contractor shall submit to the Architect, with each monthly Application for Payment; a copy of the progress schedule updated to reflect the current status of the project. All schedule updates shall address the subject of how the Contractor intends to address any critical path delays previously encountered. The schedule and all updates should address submittal activities as well as actual field construction activities. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work. The Contractor's schedule shall be prepared in a format which at a minimum graphically portrays (1) the beginning and duration for each phase of the Work described in those specification sections included in the Project Manual, (2) a critical path, meaning a limited sequence of critical activities, which establishes a linked sequence of each critical activity, a delay to any of which will cause a delay in completion of the Work, and (3) the float, indicating an activity or sequence which does not necessarily have to start or end on the scheduled date(s) to maintain the schedule. Approval of a Contractor's schedule does not constitute a commitment by the Owner to furnish any Owner-furnished information or material any earlier than Owner would otherwise be obligated to furnish that information or material under the Contract Documents. Failure of the Work to proceed in the sequence scheduled by Contractor shall not alone serve as the basis for a Claim for additional compensation or time. In the event there is interference with the Work, which is beyond its control, Contractor shall attempt to reschedule the Work in a manner that will hold resulting additional time and costs to a minimum. The construction schedule shall be in a detailed format satisfactory to the Owner, the Architect and Program Manager. If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner, Program Manager and the Architect and re-submitted for acceptance. The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The accepted construction schedule shall be updated to reflect actual conditions (sometimes referred to in these General Conditions as progress reports) as set forth in Section 3.10.1 or if requested by either the Owner or the Architect. The Contractor shall take whatever action necessary to assure that the project completion schedule is met.

§ 3.10.5 The Contractor's schedule may be considered when requested extensions of time are evaluated. The Owner's need for delivery of completed Work, or portions thereof, is largely controlled by the necessities of the school calendar and operations of school programs within that calendar. These needs are reflected in any schedule completion dates and milestone dates set out in the Contract Documents. The Contractor shall perform the work in such a way as to not interfere with school operations, the importance of meeting milestones and completion dates. When it appears to Owner or Contractor that a Contract milestone or completion date cannot be met, Contractor will develop with the Owner, Program Manager and Architect a plan and a budget.

§ 3.10.6 The Owner shall have the right to reschedule the time of day for the performance of any part of the Work that may interfere with the operation of the Owner's premises or any tenants or invitees thereof. The Contractor shall, upon the Owner's request, reschedule any portion of the Work affecting operation of the premises during hours when the premises are not in operation. Any rescheduling of performance of the Work under this Section 3.10.6 may be grounds for an extension of the Contract Time, if permitted under Section 8.3.1, and an equitable adjustment in the Contract Sum, if: 1) the performance of the Work was properly scheduled by the Contractor in compliance with the requirements of the Contract Documents, and 2) such rescheduling is required for the convenience of the Owner and is no attributable to any act or omission of Contractor.

~~The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and~~

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~~delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.~~**§ 3.11.1** The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.11.2 In addition to any other requirement in the Contract Documents and prior to installation, Contractor is to furnish or cause subcontractor to furnish, for the Owner and Architect's written approval, a physical sample of each specified item, product, fixture or device which is visible by the general public and/or attached to an architecturally finished surface. Samples shall be suitably labeled, adequately protected and properly stored at the site. Samples which are approved and undamaged will be considered to be suitable for incorporation into the Work.
§ 3.11.1 The Contractor shall post all Addenda on Construction Documents prior to commencing work in the site.

PAGE 25

.1 Submittals shall be submitted at the earliest possible time in order to expedite delivery of critical or long lead time items. For more complex systems and equipment (such as structural steel; doors, windows and hardware; casework; mechanical, electrical, and plumbing systems and equipment; food service equipment; sound systems and the like), the Contractor shall schedule at least 30 days for the Architect or the Architect's Consultants' review and submittals shall be sequenced logically in accordance with the schedule, required fabrication and installation time.

.2 Where colors are to be selected by the Architect, the Contractor shall submit all product color samples in adequate time to allow the Architect to prepare a complete selection schedule. In general, all submittals requiring color selection shall be submitted to the Architect within four weeks of the date of the Contract for Construction. Regarding critical delivery items, wherever feasible, the Architect will release color selections on critical materials as they are needed.

PAGE 26

.1 If, in the opinion of the Architect, the Shop Drawings, Product Data, Samples and similar submittals are incomplete, indicate an inadequate understanding of the work covered by the submittals, or indicate a lack of study and review by the Contractor prior to submittal to the Architect, the submittals will be returned, unchecked, to the Contractor for correction of these three deficiencies and subsequent resubmittal. Additional service charges as outlined in 3.2.6 may be charged by the Architect in this event.

.2 The Architect will take no action on Shop Drawings, Product Data, and Samples that have not first been certified, by stamped, signed notation, as having been checked and approved by the Contractor for use in the Work, or that are not specifically required by the Contract Documents.**§ 3.12.6** By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.
~~**§ 3.12.6** By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.~~

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been ~~approved~~ accepted by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect

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of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's ~~approval~~ acceptance thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's ~~approval~~ acceptance of a resubmission shall not apply to such revisions.

§ 3.12.9.1 Deviation from the requirements of the Contract Documents indicated on shop Drawings, Product Data, and Samples, does not constitute the required notification "in writing.
PAGE 27

§ 3.12.11 The Contractor shall submit complete Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents to the Architect at least thirty (30) days prior to the date the Contractor needs the reviewed submittals returned. Where colors are to be selected by the Architect, submit all Samples in adequate time to allow the Architect to prepare a complete selection schedule. In general, all submittals requiring color selection shall be submitted to the Architect within four weeks of the date of the contact for construction.

§ 3.12.12 The Contractor shall submit digital PDF's of Shop Drawings, Product Data, and similar submittals in the proper format according to the procedures stipulated within the Contract Documents. Digitally submitted Shop Drawings will be reviewed and marked by the Architect and/or his consultants and returned to the Contractor for his use, distribution, correction or resubmittal as required. Contractor corrections or revisions shall be resubmitted to the Architect in accordance with same procedures. The digitally marked up prints will be retained by the Architect and his consultants. Samples shall be submitted directly to the Architect for review.

§ 3.12.13 The Contractor shall provide MEP coordination drawings within a schedule mutually agreed upon by the Team and prior to installing the Work, showing how all piping, ductwork, lights, conduit, equipment, etc. will fit into the ceiling space allotted, including clearances required by the manufacturer, by code, or in keeping with good construction practice. Space for all trade elements must be considered on the same drawing. Drawings shall be at ¼ inch per foot minimum scale and shall include invert elevations and sections required to meeting intended purpose. The Contractor may propose an alternate method of accomplishing MEP coordination. If the alternate method is approved by the Team, it may be utilized.

~~The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.~~ **§3.13.1** The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment. When the Work is to be performed at an existing school location, Contractor shall schedule and perform the Work in a manner that does not compromise the safety to school students, faculty and staff, and does not unreasonably disrupt or interfere with the continuing normal routine of the school. If a School Operations Parameters Statement is a part of the Contract Documents, Contractor will comply with its terms, at no increase in price.

§ 3.13.2 Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction material and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

§ 3.13.3 The Contractor and any entity for which the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner.

§ 3.13.4 Contractor shall ensure that the Work, at all times, is performed in a manner that affords the Owner reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building material and equipment likely to cause hazardous conditions. Without limitation of any other provision of the Contract Documents, Contractor shall use its best efforts to minimize any interference with the

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occupancy or beneficial use of: 1) any area and buildings adjacent to the site or the Work or 2) the building in the event of partial occupancy.

§ 3.13.5 Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrance and parking areas other than those designated by the Owner. Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site and the Building, as amended from time to time

PAGE 28

§ 3.14.3 Leave all chases, holes and openings, straight and true, of proper size, and cut them into existing work as may be necessary for the proper installation of the work. Consult with all Subcontractors concerned, regarding proper locations and size. In case of conflict between requirement for cutting and patching and any other requirement of the Work, submit request for direction before proceeding with the Work. In case of failure to leave or cut them in the proper place, openings shall be cut afterward at no expense to the Owner. No excessive cutting will be permitted, nor shall any piers or other structural members be cut without prior approval. After such work has been installed, satisfactorily and carefully fit around, close up, repair, patch, and point up all cuts. Work shall be done with proper tools by workmen of the particular trade to which work belongs and shall be done without extra expense to the Owner. No description of specific cutting, patching, digging, etc., required for the work under a Specification Section that may be required for the proper accommodation of that work to the work of other trades shall relieve the Contractor from responsibility described above.

...

§ 3.15.3 Prior to the Architect's inspection for Substantial Completion the Contractor shall clean exterior and interior surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces; clean equipment and fixtures to a sanitary condition; replace air filters in mechanical equipment; clean roof, gutters, and downspouts; remove obstructions and flush debris from drainage systems; clean site; sweep paved areas and rake clean other surfaces; remove trash and surplus materials from the site; and make the Work ready in all respects for immediate and full use by the Owner.

§ 3.15.4 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor or deducted from the final payment to Contractor.

The Contractor shall provide the ~~Owner~~ Owner, Program Manager, their designated representative, and Architect with access to the Work in preparation and progress wherever located.

PAGE 29

§ 3.18.1 ~~To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.~~**TO THE FULLEST EXTENT PERMITTED BY LAW, CONTRACTOR SHALL INDEMNIFY DEFEND AND HOLD HARMLESS THE OWNER AND ITS TRUSTEES, OFFICERS, AGENTS, AND EMPLOYEES (COLLECTIVELY, THE "INDEMNIFIED PARTIES") FROM AND AGAINST ALL CLAIMS, LOSSES, EXPENSES, COSTS, DEMANDS, SUITS, CAUSES OF ACTION, AND DAMAGES, INCLUDING WITHOUT LIMITATION, ATTORNEYS' FEES AND EXPENSES, ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE OR DEATH OF ANY EMPLOYEE OF CONTRACTOR, ITS AGENTS, OR ITS SUBCONTRACTORS OF EVERY TIER, EVEN IF THE BODILY INJURY, SICKNESS, DISEASE OR DEATH IS CAUSED BY OR**

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ALLEGED TO HAVE BEEN CAUSED BY THE NEGLIGENCE, FAULT OR STRICT LIABILITY OF ANY OF THE INDEMNIFIED PARTIES.

FOR ALL CLAIMS NOT ADDRESSED IN THE ABOVE PARAGRAPH, CONTRACTOR SHALL INDEMNIFY, DEFEND AND HOLD HARMLESS THE OWNER AND ITS TRUSTEES, OFFICERS, AGENTS, AND EMPLOYEES AND (COLLECTIVELY, THE "INDEMNIFIED PARTIES"), FROM AND AGAINST ALL CLAIMS, LOSSES, EXPENSES, COSTS, DEMANDS, SUITS, CAUSES OF ACTION, AND DAMAGES, INCLUDING WITHOUT LIMITATION, ATTORNEYS' FEES AND EXPENSES, OF ANY NATURE WHATSOEVER ARISING OUT OF OR RELATED TO THIS AGREEMENT OR THE WORK TO BE PERFORMED UNDER THIS AGREEMENT, BUT ONLY TO THE EXTENT OF THE NEGLIGENCE OR OTHER FAULT OF THE CONTRACTOR, ITS AGENTS, REPRESENTATIVES, EMPLOYEES OR SUBCONTRACTORS OF ANY TIER.

§ 3.18.2 ~~In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.~~It is understood and agreed that Subparagraph 3.18 above is subject to, and expressly limited by, the terms and conditions of TEX. CIV. PRACT. & REM. CODE ANN. 130.001-130.005 (Vernon Supp. 1989), as amended or modified, or any successor statute. Contractor shall **not** be obligated under Subparagraph 3.18 to indemnify or hold harmless Program Manager, Architect or any agent, servant of employee of Architect from liability or damage that is caused by or results from:

.1 defects in plans, designs or specifications prepared, approved or used by the Architect; or

.2 negligence of the Architect in the rendition or conduct of professional duties called for or arising out of the Contract Documents and the plans, designs or specifications that are a part of the Contract Documents; and arises from:

.1 personal injury or death;

.2 property injury; or

.3 any other expense that arises from personal injury, death or property injury.

§ 3.18.3 It is agreed with respect to any legal limitations, now or hereafter in effect and affecting the validity or enforceability of the indemnification obligation under Paragraph 3.18, such legal limitations are made a part of the indemnification obligation and shall operate to amend the indemnification obligation to the minimum extent necessary to bring the provision into conformity with the requirements of such limitations, and as so modified, the indemnification obligation shall continue in full force and effect.

§ 3.19 Record Drawings

§ 3.19.1 Refer Owner's Closeout Procedures

§ 3.20 Prevailing Wage Rates

§ 3.20.1 As required by Chapter 2258 of the Texas Government Code Title 10 Prevailing Wage Rate, no employee used in this construction may be paid less than the minimum prevailing wage rate in effect for the Owner.

§ 3.20.2 The Contractor and each Subcontractor and Sub-subcontractor shall pay to all laborers, workmen, and mechanics employed in execution of this Contract not less than rates set forth by law for each craft of type of workman or mechanic needed to execute this Contract.

§ 3.20.3 Determination of prevailing wages shall not be construed to prohibit payment of more than the rates identified.

§ 3.21 Antitrust Violations

§ 3.21.1 Contractor hereby assigns to Owner any and all claims for overcharges associated with this Contract which arise under the antitrust laws of the United States, 15 U.S.C.A. Section 1 et.seq. (1973). The Contractor shall include this provision in his contracts with each Subcontractor and Supplier. Each Subcontractor shall include such provision in contracts with Sub-subcontractors and suppliers.

§ 3.22 Third-Party Beneficiary

§ 3.22.1 No person or entity shall be deemed to be a third-party beneficiary of any provision(s) of this Contract; nor

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shall any provision(s) hereof be interpreted to create a right of action or otherwise permit anyone not a signatory party to the Contract to maintain an action for personal injury or property damage.

PAGE 30

§ 4.1.3 Except as expressly provided herein, the Contractor shall not be relieved of Contractor's obligation to perform the Work in strict accordance with the Contract Documents by the responsibilities, activities or duties of the Architect.

§ 4.2.1 ~~The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have~~ Certain portions of the administration of the Contract will be performed by the Architect, others by the Program Manager. Both the Architect and the Program Manager will be treated as the Owner's representative to the extent set out in the Contract Documents. Neither the Architect nor the Program Manager shall have the authority to act on behalf of ~~the Owner only to the extent provided in the Contract Documents.~~Owner unless such authority is expressly granted in the Contract Documents, nor shall such authority be implied from any act or representation of the Architect or Program Manager..

§ 4.2.2 The ~~Architect~~ Architect, as a representative of the Owner, will visit the site at intervals appropriate to the stage of ~~construction, or as otherwise agreed with the Owner, to become generally familiar with~~ the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the work, and (3) to determine in general if the ~~Work observed~~ work is being performed in a manner indicating that the ~~Work,~~ work, when fully completed, will be in accordance with the Contract ~~Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for~~ documents. The Architect will be required to make on-site inspections as necessary to keep the Owner informed of the progress of the Work and as necessary to guard the Owner against defects and deficiencies in the Work. The Architect will neither have control over or charge of, no be responsible for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under ~~the Contract Documents.~~the Contract Documents, except as provided in Section 3.3.1. Further:

.1 The Contractor expressly recognizes that the Architect does not owe him any duty to supervise or direct his work as to protect the Contractor from the consequences of his own acts or omissions.

.2 Upon reasonable request by the Owner, the Contractor shall accompany the Owner and Architect on an observation tour(s) of the building and shall note any defects and start remedying these defects within ten (10) days of the observation tour. Contractor shall prosecute the Work without interruption until accepted by the Owner and the Architect.

.3 Section 4.2.2, and the provisions of the Architect's Agreement with the Owner shall govern the number of site visits by the Architect. In this case, the Owner and Architect may agree in writing on an alternative site visit schedule that is appropriate for this particular project.

.4 If during the Architect's site visits the Architect observes any deviation from requirements of the Contract Documents, the Architect (or designee) shall report within three (3) business days to the Owner any such deviation. A copy of said report shall be sent to the Contractor. Failure to observe or report any deviation shall not be a waiver to subsequently require correction of the same, similar or other deviations.

PAGE 31

§ 4.2.6 The Architect ~~has~~ shall have authority to reject Work that does not conform to the Contract Documents. The Architect shall be required to promptly notify the Owner of any non-conforming Work and shall reject such non-conforming Work unless the Owner objects to the rejection in writing within twenty-four (24) hours of such notification. Whenever the Architect considers it necessary or ~~advisable,~~ advisable for implementation of the intent of the Contract documents, the Architect will have authority to require inspection or testing of the Work in accordance with ~~Sections 13.4.2 and 13.4.3, whether or not the~~ the provisions of the Contract Documents, whether or not such Work is fabricated, installed or completed. Performance of any additional inspection or testing, which would result in additional cost to the Owner, shall require advance notice to and approval of the Owner. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall

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give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of ~~the Work.~~
the Work, except when the Contractor's inability to perform the Work is a result of design flaw, error or omission.

...

§ 4.2.8.1 Allowance Expenditure will be authorized using Allowance Expenditure authorizations (AEA) executed by the Owner, the Architect and the Contractor. All Allowance Expenditure Authorizations will be incorporated into the contract by Change Order at the completion of the project. Work authorized by an AEA may be invoiced as it is completed.

PAGE 32

§ 4.2.13 ~~The Architect's~~ All decisions on matters relating to aesthetic effect ~~will be final if consistent with the intent expressed in the Contract Documents.~~shall initially be made by the Architect; however, all such decisions are subject to the Owner's written approval.

...

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor. Wherever relevant, the term "Subcontractor" shall also include a person, or entity who supplies material or equipment for the Project.
PAGE 33

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution. Prior to such change the Contractor shall notify the Architect of his intent and reasons for such proposed change**§ 5.2.5** The Contractor shall submit the list of proposed Subcontractors on AIA Document G805. The Contractor may obtain blank copies from the Architect.

§ 5.2.6 Contractor shall promptly notify the Owner, Architect and Program Manager of any material defaults by any subcontractor.

...

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the ~~subcontract.~~subcontract, but only to the extent permitted by law.

...

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. ~~If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.~~

...

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate ~~agreements.~~ agreements The Owner reserves the right to perform ~~construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.~~other construction work, maintenance and repair work and school program operations at the site and near the site during the time period of the Work. Owner may perform other Work with separate Contractors or forces. Owner shall have access to the building on the site at all times..

...

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~~§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.~~

~~§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.~~

§ 6.1.3 The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the other until subsequently revised.

§ 6.1.4 It shall be the responsibility of the Contractor to assist, review, coordinate, and schedule work performed by any of Owner's separate contractors including the hazardous materials abatement contractor. Contractor shall not be required to contract directly with the hazardous materials abatement contractor's and Owner's separate contractor's work, including required monitoring, testing and inspections by independent firms, with the Work under this Agreement. The Contractor shall be totally responsible for coordination between its Subcontractors and the hazardous materials abatement contractor and any other Owner's separate contractors. Contractor will cooperate with the Owner to allow site access and staging areas for hazardous materials abatement contractor and Owner's separate contractors and consultants. Contractor shall review Owner's contract with the hazardous materials abatement contractor and Owner's separate contractors and become familiar with the requirements and scope of services contain therein. Contractor shall continually review the work performed by the hazardous materials abatement contractor and Owner's separate contractors and immediately notify the Owner and Program Manager if at any time during the performance of Contractor's work, the hazardous materials abatement contractor or any of Owner's separate contractors fail, in any way, to provide sufficient, competent manpower or timely perform its services.

PAGE 34

§ 7.1.1.1 No change in the Contract Sum and/or Contract Time will be allowed for a change in the Work unless, prior to performing the changed Work, the Contractor has provided the Owner in writing with a proposal for any change in price and/or change in Contract Time caused by the change in Work, and a Change Order is subsequently executed. A field directive or field order shall not be recognized as having any impact upon the Contract Sum or the Contract Time.

§ 7.1.1.2 Contingency Allowance Expenditure Authorization. A change in the work that does not require a change in Contract Sum or Contract Time may be paid from a designated Project Allowance. A Contingency Allowance Expenditure Authorization (CAEA) is a written order prepared by the Architect and signed by the Architect, Owner, Contractor and Program Manager directing a change in the Work.

§ 7.1.2 A Change Order shall be based ~~upon agreement among the Owner, Contractor, and Architect.~~ on agreement among the Owner's Board of Trustees, Contractor, and Architect, except when the Contract balance is amended as a result of Owner's Right to Carry out the Work under Section 2.4. or the Owner's assessment of liquidated damages as allowed by the Contract Documents. In such event, the Change Order is deemed approved by Contractor, and Contractor's signature(s) are not required. A Construction Change Directive requires agreement by the ~~Owner and Architect~~ Owner, or the Owner's representative, and Architect, and may or may not be agreed to by the ~~Contractor. An~~ Contractor; an order for a minor change ~~in the Work~~ may be issued by the Architect alone.
§ 7.1.2.1 Contractor shall make no change in the materials used or in the specified manner of constructing and/or installing the work or supply additional labor, services, or materials beyond that actually required by the terms of the Contract Documents, unless made pursuant to a written order from Owner authorizing Contractor to proceed with the change. No claim for an adjustment of the contract price will be valid unless so ordered.
PAGE 35

§ 7.2.2 Methods used in determining adjustments to the Contract Sum shall be determined in one or more of the ways

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listed below. The first method listed shall be used unless the Architect determines that the method is inappropriate, in which case another method shall be selected:

.1 By mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation. Where additional Work is involved, any lump sum over the amount of $10,000.00 shall be broken down to represent the estimated cost of labor and materials plus mark-ups to cover overhead and profit.

.1 To compensate the Contractor, Subcontractor, or Sub-subcontractor actually performing a part of the Work for the combined cost of overhead and profit, the performing party shall be entitled to a single mark-up not to exceed 10% of the estimated cost of that part of the Work.

.2 To compensate (a) the Contractor for the combined cost of overhead and profit on Work performed by Subcontractors, or (b) Subcontractors for the combined cost of overhead and profit on Work performed by Sub-subcontractors, the Contractor or Subcontractor shall be entitled to a single mark-up not to exceed 5% of the subcontract amount.

.3 When a Sub-subcontractor performs the Work of a change, the maximum mark-up not to exceed 10% for combined overhead and profit shall be used only by the Sub-subcontractor. The Contractor and Subcontractor would each be entitled to a single mark-up not to exceed 5% of the cost to them for the Subcontractor and Sub-subcontractor, respectively.

.2 By Unit Prices stated in the Contract Documents or subsequently agreed upon. Additional mark-ups for overhead and profit will not be allowed in Unit Price work.

.3 By cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee.

.4 Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.2.2 shall be limited to the costs established in Sections 7.3.7.1 through 7.3.7.5.

§ 7.2.3 Agreement on any Change Order shall constitute a final settlement of all claims by the Contractor directly or indirectly arising out of or relating to the change in the Work which is the subject of the Change Order, including, but not limited to, all direct and indirect costs and impact costs associated with such change and any and all adjustments to the Contract Sum and the Contract Time.

PAGE 36

§ 7.3.3 ~~If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:~~

~~**.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;~~

~~**.2** Unit prices stated in the Contract Documents or subsequently agreed upon;~~**§ 7.3.3** If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the methods described in Section 7.2.2 or as provided in Section 7.3.4.

~~**.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or~~

~~**.4** As provided in Section 7.3.4.~~

...

.4 Costs of premiums for all bonds and insurance, permit fees, ~~and sales, use, or similar taxes, directly related to the change;~~ directly related to the change and required by Contract Documents (unless the change is charged to an allowance already included in the Contract Sum, in which case additional mark-ups for these items will not be allowed; and

PAGE 37

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§ 7.5 Allowable Markups for Changes in the Work

§ 7.5.1 Unless otherwise directed, the procedure and markup of the costs for additional work shall be determined in the following manner:

.1 Upon Change Proposal request, the Contractor shall quote the cost for changes in the work showing separately, credits and additional costs broken down by headings used in the Schedule of Values. Further breakdown into units of labor and materials may be required if agreement on cost cannot be reached using the breakdown by headings. The final cost shall be the amount of the Total Contract Value Change shown on the Change Proposal signed by the Contractor and Owner. For general construction work, not subcontracted, the Contractor shall consider as costs the actual invoice amount for additional materials, the sales tax on additional materials when applicable, the wages paid for additional direct labor, plus the Contractor's usual markup of wages to cover additional labor related costs such as insurance, taxes and fringe benefits.

.2 On changes executed within the Owner's Contingency Allowance, Contractor shall have included costs for combined overhead and profit, to the extent permitted by the Contract Documents, and General Conditions costs, including the cost of superintendents, field office expense, temporary facilities and services, small hand tools, construction equipment not specifically provided for the change in hand, home office expense, bond and building insurance premiums, and managing the Subcontractor's work, in his Base Contract amount. Allowed overhead and profit fee on Owner's Contingency Allowance changes to be included in the total cost to the Owner shall be based as follows:

.1 For each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor's of Sub-subcontractor's own forces, ten percent (10%) of the cost.

.2 For each Subcontractor, for Work performed by the Subcontractor's Sub-subcontractors, five percent (5%) of the amount due the Sub-subcontractors.

§ 7.5.2 If any additional Work is authorized outside of or in excess of the Owner's Contingency Allowance, the combined overhead and profit for this work shall be based as follows:

.1 For the Contractor, for Work performed by the Contractor's own forces, a maximum total markup of ten percent (10%) of the actual cost on a lump sum project, or the Contractor's Construction Phase Fee on a Guaranteed Maximum Price Project.

.2 For Work performed by the Contractor's Subcontractor(s), five percent (5%) of the amount due the Subcontractor(s).

.3 For each Subcontractor or Sub-subcontractor involved, for work performed by that Subcontractor's or Sub-subcontractor's own forces, a maximum markup of ten percent (10%) of the actual cost.

.4 For each Subcontractor, for work performed by the Subcontractor's Sub-subcontractors, five percent (5%) of the amount due the Sub-subcontractor.

.5 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.7.

§ 7.5.3 In order to facilitate checking of quotations for extras or credits, all proposals, (except those so minor that their propriety can be seen by inspection), shall be accompanied by a complete and detailed itemization of costs including labor, materials, and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change be approved without such itemization.

§ 7.5.4 Change orders, as they are accepted by the Owner, shall be entered under heading "Change Orders" in the next current Request for Payment.

§ 7.5.5 All credits to or deductions from the Contract Sum, a Contingency or an Allowance shall be calculated using the same methodology set forth in this Section 7.5. All unused Contingency or Allowance amounts shall be credited back to Owner prior to final payment, along with any markups included in the Contract Sum or GMP on such unused amounts.

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§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined. See further definition of "Day" in Section 1.9.10.§ 8.2 Progress and Completion
~~§ 8.2 Progress and Completion~~

...

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by ~~(1)~~ an act or neglect of the Owner or Architect, or of an employee of either, or of a ~~Separate Contractor; (2)~~ separate contractor employed by the Owner, or by changes ordered in the ~~Work; (3)~~ Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable ~~casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines,~~ casualties or other unforeseeable causes beyond the Contractor's control, or by other causes which the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine. **No extensions of the Contract Time will be granted for inclement weather, except for Force Majeure events consisting of named storms or government declared emergencies resulting from extreme weather.**

...

§ 8.3.4 The parties hereto agree that time is of the essence of this Contract and that pecuniary damages would be suffered by the Owner if the Contractor does not substantially complete all Work called for in the Contract Document by the specified date, which damages are, by their very nature, difficult of ascertainment. It is therefore expressly agreed, as a part of the consideration inducing the Owner to execute this Contract that the Owner may deduct from the final payment made to the Contractor a sum equal to the amount stated in the Contract Documents, per phase for each and every Calendar Day beyond the agreed date which the contractor has agreed to for Substantial Completion of the Work included in the Contract Documents. It is expressly understood that said sum per day is agreed upon as a fair estimate of the pecuniary damages which will be sustained by the Owner in the event that the Work is not substantially completed within the agreed time, or with the legally extended time, if any, otherwise provided for herein. Said sum shall be considered as liquidated damages only, and in no sense shall be considered a penalty or forfeiture; said damage being caused by additional compensation to personnel, and other miscellaneous increased costs, all of which are difficult of exact ascertainment. The liquidated damages assessed herein shall be Owner's sole remedy for time delays between the deadline for substantial completion and Contractor's achievement of substantial completion.

§ 8.3.5 Failure to complete and close-out the Project, and complete all Punch List items, within sixty (60) days after the scheduled Substantial completion date will additionally entitle the Owner to deduct from the final payment made to the Contractor a sum equal to the amount stated in the Contract Documents, per phase, for each and every Calendar Day beyond the 60-day close-out period. It is expressly understood that said sum per day is agreed upon as a fair estimate of the pecuniary damages which will be sustained by the Owner in the event that the Project close-out does not occur on a timely basis. Said sum shall be considered as liquidated damages only and in no sense shall be considered a penalty or forfeiture; said damage being caused by additional compensation to personnel, and other miscellaneous increased costs, all of which are difficult of exact ascertainment. If the Contractor is delayed through no fault of the Owner, the Substantial Completion is not achieved by the agreed contract completion date, the Project close-out period of sixty (60) days will not be extended by the number of days of delay past the actual Substantial completion date and will remain based upon the agreed contract completion date.

PAGE 39

§ 9.1.1.1 The Owner is exempt from payment of Texas State Sales Tax on materials required for the Work. Therefore, to comply with the law, the Contract Sum shall be broken down into the amount of cost for labor and the amount of cost for materials. This breakdown shall be provided by the Contractor within ten (10) days of award of Contract.

...

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~~Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.~~**§ 9.2.1** Before the first Application for Payment, the Contractor shall submit to the Architect and Program Manager a schedule of values fairly allocating the various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as reasonably required by the Architect and Program Manager, and updated for changes in the Work, the schedule of values shall be used only as a basis for reviewing the Contractor's Applications for Payment and is not to be taken as evidence of market or other value. The schedule shall not overvalue early job activities. Each item shall include a pro-rata portion of overhead and profit. The schedule shall follow the divisions of the Specifications so far as practicable and shall contain line items for equipment and system start up and testing.

§ 9.2.1 General Contractor's cost for Contractor's fee, bonds and insurance, General Conditions, etc., shall be listed as individual line items.

§ 9.2.2 Schedule of Values shall break each line into materials and labor. Once approved by the Owner and Architect, it shall be used as basis for reviewing Application for Payment but not be taken as evidence of market or other value.

§ 9.2.3 Contractor's cost for various construction items shall be detailed. For example, concrete work shall be subdivided into footings, grade beams, floor slabs, paving, etc. These subdivisions shall appear as individual line items.

§ 9.2.4 On major subcontracts, such as mechanical, electrical, and plumbing, the Schedule shall indicated line items and amounts in detail, (for example; underground, major equipment, fixtures, installation of fixtures, start up, etc.)

§ 9.2.5 Costs for subcontract work shall be listed without any addition of General Contractor's costs for overhead, profit or supervision.

§ 9.2.6 The Contractor shall include a value for the coordination documents/drawings on the schedule of values.

§ 9.2.7 The Contractor shall include a value for the correction of deficiencies noted by the Commissioning Agent and the Test, Adjust and Balance consultant on the schedule of values for each sub-contractor subject to commissioning and test, adjust and balance requirements.

PAGE 40

§ 9.3.1 ~~At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.~~No later than 3 working days prior to the first Wednesday of each month, submit an itemized Application for Payment, supported by such data sustaining the Contractor's right to payment as the Owner or Architect may require, and reflecting retainage, as provided elsewhere in the Construction Documents. Information on the form shall be divided into the same last day of the month preceding, which shall also be the basis of payment or as agreed by the Owner, Contractor and Architect by verification at the site, prior to submittal.

§ 9.3.1.1 As provided in ~~Section 7.3.9,~~ Section 7.3.9, such applications may include requests for payment on account of changes in the Work ~~that~~ which have been properly authorized by Construction Change ~~Directives, or by interim determinations of the Architect,~~ Directives but not yet included in Change Orders.

§ 9.3.1.2 ~~Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.~~Contractor agrees, for purposes of Texas Government Code 2251.042, receipt of the

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Certified Applications for Payment from the Architect shall not be construed as receipt of an invoice by the Owner. Contractor further agrees that Program Manager's receipt of the Certificate of Payment shall be construed as receipt of an invoice by the Owner, for purposes of Texas Government Code Section 2251.042

§ 9.3.2 ~~Unless otherwise provided in the Contract Documents, payments shall~~ Payments will be made on account of materials ~~and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and~~ or equipment 1) incorporated in the Work; 2) suitably stored at the site; or 3) suitably stored at some off-site location, provided the following conditions are met for off-site storage:

.1 The location must be agreed to, in writing, by the Owner and Surety.

.2 The location must be a bonded warehouse.

.3 Surety must agree, in writing, to each request for payment.

.4 The Contractor must bear the cost of the Owner's and Architect's expenses related to visiting the offsite storage area for confirmation.

Payments for materials or equipment stored on or off the site shall be conditioned upon ~~compliance by the Contractor with~~ submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials ~~and~~ or equipment or otherwise protect the Owner's interest, ~~and shall include the costs of applicable insurance, storage, and transportation to the site, for such~~ including applicable insurance (naming the Owner as insured) and transportation to the site for those materials and equipment stored off the site. Under no circumstances will the Owner reimburse the Contractor for down payments, deposits, or other advance payments for materials or equipment.

The Contractor acknowledges that the review of materials and/or equipment stored off the side is an additional service of the Architect, and the Contractor shall be charged for that service. The cost for such service will be established by the Architect and is not subject to appeal.

...

§ 9.3.4 The Contractor shall submit requests for payment in duplicate, using AIA Document G702, Application and Certificate of Payment, as the cover sheet. Continuation sheets showing in detail the amounts requested, etc., shall be submitted using AIA Document G703, Continuation Sheet, or a computerized version of these documents previously approved for use. The information provided on the continuation sheets in the Description of the Work and Scheduled Values columns shall match the corresponding information shown on the approved Schedule of Values. All blank spaces on AIA Document G702, Application and Certificate of Payment, must be completed and the signatures of the Contractor and Notary Public shall be original on each form. By submitting his application for payment, the Contractor certifies that the individual signing the application is authorized to do so.

§ 9.3.5 The Contractor shall submit the Fort Bend ISD Subcontractor Progress Assessment Form with each application for payment requesting payment be made for Work performed by a subcontractor that qualifies as a "small business" pursuant to FBISD Board Policy CV (Local). The Contractor shall also ensure that, once Contractor makes the applicable payment to the Small Business Subcontractor, the Subcontractor completes the Fort Bend ISD Subcontractors/Subcontractors/Suppliers Payment Certification Form in its entirety and Contractor agrees to submit the completed copies to Owner with the next application for payment. The completed Fort Bend ISD Subcontractors/Subcontractors/Suppliers Payment Certification Form must be received by the Owner before any further payment will be made to Contractor for any Work performed.

PAGE 41

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect and Program Manager to the Owner, based on the Architect's and Program Manager's evaluation of the Work and the data ~~in the Application for Payment,~~ comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Architect's ~~knowledge, information, and belief, the Work has progressed to the point indicated, the~~ and Program Manager's knowledge, information and belief, the quality of the Work is in accordance with the Contract ~~Documents, and that the Contractor is entitled to payment in the amount certified.~~ Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, ~~to~~ the results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to ~~completion,~~ completion and to specific qualifications expressed by the ~~Architect.~~

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~~However, the~~ Architect and Program Manager. The issuance of a Certificate for Payment will not be a representation that the Architect and Program Manager has (1) made exhaustive or continuous on-site inspections to check the quality ~~or quantity~~ of the ~~Work;~~ Work, (2) reviewed construction means, methods, techniques, ~~sequences, or procedures;~~ sequences or procedures, (3) reviewed copies of requisitions received from the Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to ~~payment;~~ Payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

...

The Architect or Program Manager may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the ~~Architect's~~ Architect or Program Manager's opinion the representations to the Owner required by ~~Section 9.4.2~~ Section 9.4.2 cannot be made. If the Architect or Program Manager is unable to certify payment in the amount of the Application, the Architect or Program Manager will notify the Contractor and Owner as provided in ~~Section 9.4.1.~~ Section 9.4.1. If the Contractor and Architect or Program Manager cannot agree on a revised amount, the Architect or Program Manager will promptly issue a Certificate for Payment for the amount for which the Architect or Program Manager is able to make such representations to the Owner. The Architect or Program Manager may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the ~~whole~~ or ~~a~~ part of a Certificate for Payment previously issued, to such extent ~~as may be necessary~~ necessary, in the Architect's ~~opinion~~ or Program Manager's opinion, to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in ~~Section 3.3.2, because of~~Section 3.3.2, because of:

~~.1 defective~~ 1. Defective Work not remedied;

~~.2 third~~ 2. Third party claims ~~filed~~ field or reasonable evidence indicating probable filing of such ~~claims,~~ claims unless security acceptable to the Owner is provided by the Contractor;

~~.3 failure~~ 3. Failure of the Contractor to make payments properly to Subcontractors or ~~suppliers~~ for labor, materials or equipment;

~~.4 reasonable~~ 4. Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

~~.5 damage~~ 5. Damage to the Owner or ~~a Separate Contractor;~~another contractor;

~~.6 reasonable~~ 6. Reasonable evidence that the Work will not be completed within the Contract ~~Time,~~ Time and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;~~or~~

~~.7 repeated~~ 7. Persistent failure to carry out the Work in accordance with ~~the Contract Documents.~~ the Contract Documents; or

8. Failure to submit a written plan indicating action by the Contractor to regain the time schedule for completion of Work within the Contract Time

PAGE 42

§ 9.5.5 If the work has not attained Substantial Completion by the date agreed upon and set forth in the Amendments, subject to extensions of time as described in the Contract Documents, Owner may, in sole discretion, direct Architect or Program Manager to withhold payment to Contractor to the extent necessary to reserve sufficient funds to complete the construction of the Project and to cover liquidated damages assessed against Contractor up to the time of the Application for Payment and to the time it is reasonably anticipated Substantial Completion will be achieved. The Owner shall not be deemed in default by reason of withholding payment as provided for in Sections 9.3.4, 9.4.3, 9.5.1, or this Section.

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make ~~payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.~~progress payments in accordance with the following Section which shall be inserted as Article 5, Progress Payments, in the Owner-Contractor Agreement, AIA Document A101, 2017 Edition.

.1 Based upon the applications for payment and supporting documents submitted to the Architect by the Contractor and certification of the amount payable by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided in the Contract Documents for the period ending the last day of the month as follows:

.2 Not later than twenty (20) working days following the first Wednesday of each month, ninety-five percent (95%) of the portion of the Contract Sum properly allocable to labor, materials, and equipment incorporated in the Work and ninety-five percent (95%) of the portion of the Contract Sum properly

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allocable to materials and equipment suitably stored at the site or at some other location agreed upon in writing, for the period covered by the Application for Payment, less the aggregate of previous payments made by the Owner. Applications for Payment shall be submitted by the first Wednesday of the month.

.3 Upon Substantial Completion of the entire Work, a sum sufficient to increase the total payments to ninety-five percent (95%) of the Contract Sum, less such amounts as the Architect shall determine for all incomplete Work and unsettled claims as provided in the Contract Documents.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. More specifically, if only five percent (5%) retainage is withheld by the Owner on payments to the Contractor, then the Contractor shall withhold only five percent (5%) retainage on payments to subcontractors; and subcontractors shall withhold only five percent (5%) retainage on payments to sub-subcontractors. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

PAGE 43

§ 9.6.9 Within seven (7) calendar days of receipt of payment from the Owner, the Contractor shall pay each subcontractor, out of the amount of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payment to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner. Owner is not obligated to monitor payments to Subcontractors or Sub-subcontractors, and nothing in this section shall create any right on the part of a Subcontractors or Sub-subcontractor against Owner, Architect or Program Manager. In compliance with Texas Government Code Section 2251.022, the Contractor shall, within ten (10) days following receipt of payment from the Owner, pay all bills for labor and materials performed and furnished by others in connection with the Work, and shall, if requested, provide the Owner with evidence of such payment. Contractor's failure to make payments within such time shall constitute a material breach of this Contract. Contractor shall include a provision in each of its Subcontractor's imposing the same payment obligations on its Subcontractors as are applicable to the Contractor hereunder, and if the Owner so requests, shall provide copies of such Subcontractor payments to the Owner. If the Contractor has failed to make payment promptly to the Contractor's Subcontractors or for materials or labor used in the Work for which the Owner has made payment to the Contractor, then the Owner shall be entitled to withhold payment to the Contractor in part or in whole to the extent necessary to protect the Owner.

§ 9.6.10 Contractor shall not withhold as retainage a greater percentage on Subcontractors or material men than the percentage Owner withheld as retainage from payments to the Contractor.

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within ~~seven~~ ten days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within ~~seven~~ ten days after the date established in the Contract Documents, the amount certified by the Architect ~~or awarded by binding dispute resolution,~~ , then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

PAGE 44

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract ~~Documents.~~Documents In order to initiate and facilitate the preparation of the Contractor's list of items to be completed or corrected (Punch List), the Architect and Program Manager, if requested by the Contractor, will inspect a few representative rooms with the Contractor's superintendent and the office project manager to assist the Contractor in the preparation of the Contractor's Punch List. The Contractor's superintendent shall participate in the preparation of the Contractor's Punch List that is submitted to the Architect and shall personally inspect each and every item himself before certifying to the Architect that listed items have been corrected. Should the Architect determine that the Contractor's Punch List lacks sufficient detail or requires extensive supplementation, the Punch List will be returned to the Contractor for revision and the inspection for determining the Date of Substantial Completion will be delayed until the Punch List submitted is a reasonable representation of the work to be completed. To further facilitate completion of the Work the

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Contractor's superintendent shall accompany the Architect and his consultants during their inspections and the preparation of their supplements to the Punch List and the superintendent shall record or otherwise take note of those supplementary items. The Architect will endeavor to furnish to the Contractor typed, hand-lettered, written or recorded supplements to the Punch List in a prompt manner; however, any delay in the Contractor's receiving said supplements from the Architect shall not be cause for a claim for additional cost or extension of time as the Contractor's superintendent shall have been in attendance during the inspections of the Architect and his consultants and will have been expected to taken his own notes. Furthermore, a significantly large number of items to be completed or corrected will preclude the Architect from issuing a Certificate of Substantial Completion. The Owner and Architect will be the sole judges of what constitutes a significantly large number of items.

...

§ 9.8.6 In order for the project or a major portion thereof to be considered substantially complete, the following conditions must be met:

.1 All inspections by governmental authorities having jurisdiction over the project must have been finalized, any remedial work required by those authorities must have been completed, and Certificates of Occupancy and similar governmental approval forms must have been issued and copies delivered to the Owner and Architect.

.2 All work, both interior and exterior, shall have been completed and cleaned except minor items which if completed after occupancy, will not, in the Owner's opinion, cause interference to the Owner's use of the building or any portion thereof. A significantly large number of items to be completed or corrected will preclude the Architect from issuing a Certificate of Substantial Completion. The Owner and Architect will be the sole judge of what constitutes a significantly large number of items.

The following items are a partial specific list of requirements, as applicable to the Project, that must be completed **prior** to established Substantial Completion of all portions of the work (Including the Substantial Completion of the commissioning phase).

1. All fire alarm system components must be completed and demonstrated to the Owner.
2. Local fire marshal approval certificate, or similar Certificate of Occupancy from the governing agency, must be delivered to the Owner.
3. All exterior clean-up and landscaping must be complete.
4. All final interior clean-up must be complete.
5. All HVAC air and water balancing must be complete.
6. All required commissioning must be complete.
7. All Energy Management Systems must be complete and fully operational and demonstrated to the Owner.
8. All communications equipment, telephone system, and P.A. systems must be complete and demonstrated to the Owner.
9. All final lockset cores must be installed and all final Owner directed keying completed.
10. All room plaques and exterior signage must be completed.
11. All Owner demonstrations must be completed including kitchen equipment, HVAC equipment, plumbing equipment, and electrical equipment.
12. A final certificate of occupancy must be signed by the Contractor and delivered to the Owner.

§ 9.8.7 After the date of Substantial Completion of the Project, as evidenced by the Certificate of Substantial Completion, G704 current edition, the Contractor will be allowed a period of thirty (30) days (unless extended by mutual agreement or provision of the Contract) within which to correct all deficiencies attached to the Certificate of Substantial Completion. Failure of the Contractor to complete such corrections within the stipulated time will be reported to the Contractor's Surety. In the report of deficiency, the Contractor and Surety will be informed that, should correction remain incomplete for fifteen (15) additional days, the Owner may initiate action to complete corrective work out of the remaining Contract funds in accordance with Section 14.2. Additional costs of the Owner, Architect, and other consultants incurred because of the Contractor's failure to complete the correction of deficiencies within thirty (30) days after the date of Substantial Completion (unless extended by mutual agreement or provision of the Contract) may be deducted from the funds remaining to be paid to the Contractor. Should corrective work following Substantial Completion require more than one reinspection after notification by the Contractor that corrections are complete, the cost of subsequent inspections may also be deducted from funds remaining unpaid to the Contractor.

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PAGE 45

§ 9.10.1 Upon receipt of ~~the Contractor's~~ written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such ~~inspection. When the Architect~~ inspection and, when the Architect and the Program Manager finds the Work acceptable under the Contract Documents and the ~~Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and~~ Contractor fully performed, the Architect and the Program Manager will promptly prepare, sign and issue a Certificate of Final Completion and a final Certificate for Payment certifying to the Owner that, on the basis of the Architect's and the Program Manager's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire ~~balance~~ balance, including all retainages found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's and the Program Manager's final Certificate for Payment will constitute a further representation that conditions listed in ~~Section 9.10.2~~ Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees. Prior to final payment, the Contractor shall meet all of the requirements of Owner's Closeout Procedures.**§ 9.10.3** If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

~~**§ 9.10.3** If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.~~

PAGE 46

§ 9.10.6 Final Payment, constituting the entire unpaid balance of the Contract Sum, shall be paid by the Owner to the Contractor thirty-one (31) days after Substantial Completion of the Work unless otherwise stipulated in the Certificate of Substantial Completion, provided the Work has then been completed, the Contract fully performed, all Contract Close Out Documents have been submitted, and the Final Certificate for Payment has been issued by the Architect.

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The final payment will not be made until all of these conditions have been satisfied.**§ 9.10.7** Contractor agrees that the Owner may place and install as much equipment and furnishings during the progress of the building as is possible before completion of the various parts of the Work, or may occupy portions of the Work before substantial completion of the entire Work, and further agrees that such placing and installing of equipment and furnishings or occupancy of portions of the Work shall not in any way evidence the substantial completion of the entire Work, or signify Owner's acceptance of the Work, nor does it affect claims for liquidated damages in case Substantial Completion is not achieved as required unless the failure to reach Substantial Completion is the result of the early move-in or occupancy. Owner will assume the responsibility for any damages to the Work caused by such occupancy.

PAGE 47

§ 10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract and shall conform to all provisions of the "Manual of Accident Prevention in Construction", published by the Associated General Contractor of America, Inc. latest edition and the Contractor further agrees to fully comply with all safety standards required by the Occupational Safety and Health Administration (:OSHA") 29 USC Section 651 et seq,. and all amendments thereto. However, the Contractor's duties herein shall not relieve any Subcontractor and any other person or entity, including any person or entity required to comply with all applicable federal, state and local laws, rules, regulations, and ordinances, form the obligation to provide for the safety of their employees, persons and property and their requirements to maintain a work environment free of recognized hazards.

§ 10.1.2 Contractor's employees, agents, Subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, shall not perform any service for Owner while under the influence of any amount of alcohol or any controlled substance, or use, posses, distribute, or sell alcoholic beverages while on Owner's premises. No person shall use, possess, distribute, or sell illicit or unprescribed controlled drugs or drug paraphernalia; misuse legitimate prescription drugs; or act in contravention of warnings on medications while performing the Work or on Owner's premises.

§ 10.1.3 Contractor has implemented it's own Safety Manual to assure a drug-free and alcohol-free workplace while on Owner's premises or performing the Work. Contractor will remove any of its employees, agents, subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, from performing the Work any time there is suspicion of alcohol and/or drug use, possession, or impairment involving such person, and at any time an accident occurs where drug or alcohol use could have been a contributing factor, Owner has the right to require Contractor to remove any person from performing the Work any time cause exists to suspect alcohol or drug use. In such cases, the person so removed may only be considered for return to work after the Contractor certifies as a result of a for-cause test, conducted immediately following removal that said person was in compliance with this Contract. Contractor will not use any person to perform the Work who fails or refuses to take, or tests positive on, any alcohol or drug test.

§ 10.1.4 Contractor will comply with all applicable federal, state and local drug and alcohol-related laws and regulations (e.g., Department of Transportation regulations, Drug-Free Workplace Act). Owner has also banned the presence of all weapons on the Project site, whether or not the owner thereof has a permit for a concealed weapon, and the Contractor agrees that the Contractor's representative, employees, agents, and sub-contractors will abide by the same.

...

§ 10.2.3 The Contractor shall ~~implement, erect,~~ erect and maintain, as required by existing conditions and performance of the Contract, reasonable ~~safeguards~~ safeguards, for safety and protection, including posting danger signs and other warnings against ~~hazards;~~ hazards, promulgating safety ~~regulations;~~ regulations and notifying ~~the~~ owners and users of adjacent sites ~~and utilities of the safeguards.~~and utilities. The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property adjacent to the Project and improvements therein. Any damage to such property for improvements shall be promptly repaired by the Contractor. Contractor shall provide reasonable fall protection safeguards and provide approved fall protection safety equipment for use by all exposed Contractor employees.

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§ 10.2.4 When use ~~or~~ of storage of ~~explosives or other~~ hazardous materials or ~~equipment,~~ equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such ~~activities under supervision of properly qualified personnel.~~
under supervision of properly qualified personnel, and shall only conduct such activities after giving reasonable advance written notice of the presence or use of such materials, equipment or methods to Owner and Architect. The storage of explosives on Owner's property is prohibited. The use of explosives materials on Owner's property is prohibited unless expressly approved in advance by authorities having jurisdiction and in writing by Owner and Architect. When use or storage of hazardous materials or equipment or unusual construction methods are necessary, the Contractor shall give the Owner, Program Manager and the Architect reasonable advance notice of the presence or use of such materials, equipment, or methods.
PAGE 48

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect. Additionally, Contractor shall submit a Safety Plan for the Owner's approval prior to commencing the Work which meets or exceeds the minimum requirements set forth in the provisions of the FBISD Safety Plan. Unless otherwise specified in the Contract Documents, Contractor shall be responsible for initiating, maintaining, supervising, and enforcing all safety precautions and programs in connection with the Work. It shall be the duty and responsibility of the Contractor and all of its Subcontractors to be familiar and comply with all requirements of Public Law 91-596,29 U.S.C. § 651 et. Seq., the Occupational Safety and Health Act of 1970, (OSHA) and all amendments thereto, and to enforce and comply with all the provisions of the Act. Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property to protect them from damage, injury or loss and shall erect and maintain all necessary safeguards for such safety and protection. However, the Contractor's duties shall not relieve any subcontractor(s) or any person or entity (e.g. a supplier) including any person or entity with liability relative to compliance with all applicable federal, state and local laws, rules, regulations, and ordinances which shall include the obligation to provide for the safety of their employees, persons, and property and their requirements to maintain a work environment free of recognized hazards.

...

§ 10.2.9 The performance of the foregoing services by the Contractor shall not relieve the Subcontractors of their responsibilities for the safety of persons and property and for compliance with all applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to the conduct of the Work.

§ 10.2.10 The Contractor shall be responsible for taking all precautions necessary to protect the Work in place from any foreseeable weather conditions which could cause any potential damage to portions or all Work in place. The Contractor shall be responsible for performing all repairs and/or replacement of any Work that results from foreseeable weather conditions.

§ 10.2.11 The Contractor shall promptly report in writing to the Owner, Program Manager and Architect all accidents arising out of or in connection with the Work which cause death, personal injury, or property damage, giving full details and statement of any witness. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner, Program Manager and the Architect.

§ 10.2.12 The Contractor shall be responsible for the protection and security of the Work until it receives written notification that the Substantial Completion of the Work has been accepted by the Owner.

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous ~~materials or substances.~~ materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or ~~substance, including but not limited to asbestos or polychlorinated biphenyl (PCB),~~ substance encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and ~~notify the Owner and Architect of the condition.~~report the condition to the Owner and Architect in writing. The Owner, Contractor and Architect shall then proceed in the same manner described in Section 10.3.2.

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§ 10.3.1.1 Owner and Contractor may enter into a separate agreement and/or Change Order for Contractor to remediate and/or render harmless the Hazardous Substance, but Contractor shall not be required to remediate and/or render harmless the Hazardous Substance absent such agreement. Contractor shall not be required to resume work in any area affected by the Hazardous Substance until such time as the Hazardous Substance has been remediated and/or rendered harmless.

PAGE 49

~~**§ 10.3.3** To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.~~

~~**§ 10.3.4** The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.~~

~~**§ 10.3.5** The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.~~

~~**§ 10.3.6** If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.~~

§ 10.3.7 As part of the construction contract close out process, and prior to receiving payment of any of the retainage, the Contractor and his subcontractors shall submit notarized statements pertaining to the above referenced hazardous materials.

...

The Owner reserves the right to review the insurance requirements during the effective period of any Contract to make reasonable adjustments to insurance coverages and limits when deemed reasonably prudent by Owner based upon changes in statutory laws, court decisions or potential increase in expense to loss.

~~**§ 11.1.1** The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.~~

~~**§ 11.1.2** The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.~~

~~**§ 11.1.3** Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.~~

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~~**§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance.** Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.~~

~~**§ 11.2 Owner's Insurance**~~

~~**§ 11.2 § 11.2.1** The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.~~ **§ 11.2.1 § 11.2.2 § 11.2.3 § 11.2.4 § 11.2.5 § 11.2.6 intentionally deleted.**

Please refer to Exhibit A to AIA Document A133-2009, Insurance and Bond Requirements.

~~**§ 11.2.2 Failure to Purchase Required Property Insurance.** If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.~~

~~**§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance.** Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.~~

~~**§ 11.3 Waivers of Subrogation**~~

~~**§ 11.3.1** The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.~~

§ 11.3 The Owner requires that the following insurance requirements be satisfied:

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.1 No Work shall be commenced until all insurance requirements set forth in this Agreement have been approved by the Owner in writing.

.2 All insurance policies and certificates required hereunder shall be in form and content satisfactory to the Owner.

.3 The Owner shall be furnished an ACORD form Certificate of Insurance evidencing all policies and endorsements required by this Agreement prior to execution of the Contract and thereafter upon renewal or replacement of each required policy of insurance.

.4 Each Insurance coverage/policy shall contain a provision that at least thirty (30) days prior written notice shall be given to the Owner in the event of cancellation, material change, or non-renewal.

.5 Insurance shall be underwritten by a company licensed to do business in Texas, satisfactory to Owner and rated minimum A-VII by A.M. Best.

.6 The insurance coverages specified herein shall be maintained at all times during the term of the contract and, with the exception of builder's risk coverage, shall be maintained for a minimum of one (1) year thereafter.

.7 No deletions/exclusions from the standard coverage form are allowed without the prior written consent of the Owner.

.8 All insurance except Professional Liability must be issued on an occurrence basis.

.9 The Contractor shall be responsible for all deductibles; the Owner shall approve the deductibles selected.

.10 With the exception of Excess Umbrella Coverage, the coverage afforded by each carrier must be a primary over any other applicable insurance.

.11 In addition to certificates of insurance, copies of policy endorsements must be provided (a) listing the Owner as Additional Insures, and (b) showing waivers of subrogation in favor of the Owner.

§ 11.4 Performance Bond and Payment Bond

§ 11.4.1 The Contractor shall provide a Performance Bond, in the penal sum equal to one hundred percent (100%) of the Contract Sum, if the formal Contract is in excess of One Hundred Thousand Dollars ($100,000.00) and a Labor and Material Payment bond, in the penal sum equal to one hundred percent (100%) of the Contract sum if the formal contract is in excess of Twenty Five Thousand Dollars ($25,000.00).

§ 11.4.2 The Work will not be started until the bonds and issuing companies have been accepted as satisfactory by the Owner. The original bonds will be delivered to the Owner with an attached authorized power of attorney. Such Bonds shall be issued by a company authorized to do business in the State of Texas with an A.M. Best Company rating of a least A-X and included on the U.S. Department of the Treasury Listing of Approved Sureties (Dept. Circular 570).

§ 11.4.3 The Performance Bond Form and the Payment Bond Form included herein shall be executed and submitted to the Architect in duplicate prior to commencement of the work. The surety companies must be acceptable to the Owner and licensed admitted carriers in the State of Texas; and the companies must appear in a current Federal Treasury list as Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds land as Acceptable Reinsuring companies.

§ 11.4.4 Each bond shall be of penal sum equal to one hundred percent (100%) of the Contract Sum and shall be compatible with the provisions of the governing authority. The Contractor shall file copies of each bond with the county clerk and furnish the Owner with a file receipt. The bonds shall remain in force throughout the warranty period of the contract. The Work will not be started until the bonds and issuing companies have been accepted as satisfactory by the Owner. The original bonds will be delivered to the Owner with an authorized power of attorney attached.

§ 11.4.5 Claims must be sent to the Contractor and his Surety in accordance with Article 5160, Revised Civil Statutes. The Owner will furnish in accordance with such Article, a copy of the Payment Bond as provided therein to claimants upon request. All claimants are cautioned that no lien exists on the funds unpaid to the contractor on such Contract, and that reliance on notices sent to the Owner may result in loss of their rights against the Contractor and/or his Surety. The Owner is not responsible in any manner to a claimant for collection of unpaid bills, and accepts no responsibility because of any representation by any agent or employee.

§ 11.5 Worker's Compensation Insurance

§ 11.5.1 Comply with the requirements of Rule 28, TAC §110.110, Reporting Requirements for Building or

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Construction Projects for Governmental Entities

§ 11.5.2 Definitions:

.1 Certificate of coverage ("certificate"). A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing service as on a project, for the duration of the project.

.2 Duration of the project –includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

.3 Persons providing services on the project ("subcontractor" in §406.096)-includes all persons or entities performing all or part of the services the contractor has undertaken to perform on the project, regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity which furnishes persons to provide services on the project. "Services" include without limitation, providing hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply delivery, and delivery of portable toilets.

§ 11.5.3 The Contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the Contractor providing services on the project, for the duration of the project.

§ 11.5.4 The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract.

§ 11.5.5 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

§ 11.5.6 The Contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

.1 A certificate of coverage, prior to that person beginning work on the projects so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project, and

.2 No later than seven days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

~~**§ 11.3.2** If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.~~**11.5.7** The Contractor shall retain all required certificates of coverage for the duration of the project and for one year thereafter.

~~**§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance**~~

~~The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.~~

~~**§11.5 Adjustment and Settlement of Insured Loss**~~

~~**§ 11.5.1** A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to~~

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~~requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.~~

~~**§ 11.5.2** Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.~~

§ 11.5.8 The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the Contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

§ 11.5.9 The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Worker's Compensation, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack coverage.

§ 11.5.10 The Contractor shall contractually require each person with whom it contracts to provide services on a project, to:

- **.1** Provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meet the statutory requirements of Texas Labor code, Section 401.011(44) for all of its employees providing services on the project, for the duration of the project.
- **.2** Provide the Contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project.
- **.3** Provide the Contractor, prior to the end of the coverage period shown on the current certificate ends during the duration of the project.
- **.4** Obtain from each other person with whom it contracts, and provides to the Contractor:
  - **.1** A certificate of coverage, prior to the other person beginning work on the project, and
  - **.2** A new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project.
- **.5** Retain all required certificates of coverage on file for the duration of the project and for one year thereafter.
- **.6** Notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project, and
- **.7** Contractually require each person with whom it contracts, to perform as required by these subsections (1)-(7), with the certificates of coverage to be provided to the person for whom they are providing services.

§ 11.5.11 By signing this Contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the Contractor who will provide services on the project will be covered by workers compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other actions.

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§ 11.5.12 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten days after receipt of notice of breach from the governmental entity.

PAGE 52

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense. The Owner may make emergency repairs to the Work or take such other measures necessary under the circumstance, if the Contractor does not promptly respond to a Notice of Defect or nonconforming Work. Contractor shall be responsible to Owner for this cost if the reason for the repairs is attributable to the Contractor. If payments then or thereafter due to the Contractor are not sufficient to cover such costs, then the Contractor shall pay the difference to the Owner on demand.

§ 12.2.1.1 In the event of failure of a specified project, either during construction or the correction period, the Contractor shall take appropriate measures with the manufacturer of the product to assure correction or replacement of the defective products.

§ 12.2.1.2 Refer to 01 77 00, Closeout Procedures in Division One for further terms regarding warranties which will be required prior to final payment.

§ 12.2.1.1 ~~In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.~~Approximately eleven months after substantial completion, the contractor shall accompany the Owner and Architect on an "end of the one year correction period" reinspection of the Project. Additional deficiencies observed or reported shall be corrected by the Contractor.

PAGE 53

~~If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.~~**§ 12.3.1** If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

§ 12.3.2 The Owner's use and/or occupancy of any or all of the Project site shall never be construed as an acceptance of Work not in conformance with Contract Documents. The Owner reserves the right to enforce provisions of the Contract unless the Owner's acceptance is provided to the Contractor in writing.

PAGE 55

§ 13.7 Equal Opportunity

§ 13.7.1 The contractor shall maintain policies of employment as follows:

.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during

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employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

§ 13.8 Criminal Background Checks

The Contractor/Subcontractor shall certify the Criminal Background Check, as stated in Fort Bend ISD Board Policy CJA and the form included herein, as required by Texas Education Code Section 22.0834 and Texas Administrative Code Section 153.1101 and 153.1117, and shall comply with all requirements of such laws and policy.

§ 13.9 Required Certifications

Contractor hereby certifies that it is not a company identified on the Texas Comptroller's list of companies known to have contracts with, or provide supplies or services to, a foreign organization designated as a Foreign Terrorist Organization by the U.S. Secretary of State under federal law. Contractor hereby certifies and verifies that neither Contractor, nor any affiliate, subsidiary, or parent company of Contractor, if any (the "Contractor Companies"), boycotts Israel, and contractor agrees that Contractor and Contractor Companies will not boycott Israel during the term of this Agreement. For purposes of this Agreement, the term "boycott" shall mean and include terminating business activities or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory.

Contractor verifies that: (1) it does not, and will not for the duration of the contract, boycott energy companies or (2) the verification required by Section 2274.002 of the Texas Government Code does not apply to the contract.

Contractor verifies that: (1) it does not, and will not for the duration of the contract, have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association or (2) the verification required by Section 2274.002 of the Texas Government Code does not apply to the contract.

PAGE 56

§ 14.2.5 The Contractor hereby assigns the Owner any and all claims for overcharges associated with this Contract which arise under the antitrust laws of the United States, 15 U.S.C.A. Section 1 et. Seq. (1973).

§ 14.2.6 If a Performance Bond has been furnished and the Contractor is declared by the Owner to be in default under the Contract, the Surety shall promptly remedy the default by completing the Contract in accordance with its terms and conditions, or by obtaining a bid or bids in accordance with its terms and conditions. At Owner's election, upon determination by the Owner and the Surety of the lowest responsible bidder, the Surety will complete the Work or will arrange for a Contract between such bidder and the Owner, and make available as Work progresses sufficient funds to pay the cost of completion less the balance of the Contract Sum, but not exceeding the Penal Sum of the bond and other costs and damages for which the Surety may be liable under the bond. The phrase 'balance of the Contract Sum' as used herein shall mean the total amount payable by the Owner to the Contractor under the Contract and amendments thereto less the amount previously paid by the Owner to the Contractor.

PAGE 57

§ 14.4.3 In the case of such termination for the Owner's convenience, the ~~Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.~~Contractor shall be entitled to receive payment for Work executed up to date of receipt of the notice of termination, plus costs of demobilization.

...

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. ~~The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.~~

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...

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party ~~under this Section 15.1.3.1 shall~~ must be initiated within ~~21~~ ninety (90) days after occurrence of the event giving rise to such Claim or within ~~21~~ ninety (90) days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Contractor agrees that this is a reasonable Notice requirement. Any Claim or portion of a Claim that has not been made the specific subject of a Notice strictly in accordance with the requirements of this section is waived.

PAGE 58

§ 15.1.6.2 ~~If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.~~**No extensions of the Contract Time will be granted for inclement weather, except as stated in Section 8.3.1.**

~~:~~

~~**§ 15.1.7 Waiver of Claims for Consequential Damages**~~

~~The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes~~

~~.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and~~

~~.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.~~

~~This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.~~

§ 15.2.1 Claims, excluding those ~~where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5,~~ arising under Sections 11.3.9 and 11.3.10, or claims alleging an error or omission by the Architect, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. ~~Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.~~If the parties are unable to agree, any claim, dispute or matters arising out of the contract between the Architect, Owner and Contractor or any combination of those parties shall be submitted to a court of appropriate jurisdiction.

...

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the ~~Initial~~ initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons ~~therefor;~~ therefore; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the ~~parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.~~parties, but subject to mediation, if both parties so agree, and subject to legal or equitable

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proceedings in a court having jurisdiction thereof. It is understood and agreed that, in the event that any dispute, controversy, or conflict arises during the design and construction of the Project or following its completion, the parties hereto will cooperate in good faith, if possible, to resolve the issues without resorting to litigation.

~~**§ 15.2.6** Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.~~

~~**§ 15.2.6.1** Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.~~

~~**§ 15.2.8** If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.~~

§ 15.2.9 The prevailing party in any judicial proceeding arising from the Contract Documents shall recover its reasonable and necessary attorneys' fees.

~~**§ 15.3.1** Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.~~

§ 15.3.2 The parties ~~shall endeavor~~ may mutually agree to resolve their ~~Claims~~ claims by mediation which, unless the parties mutually agree otherwise, shall be ~~administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution~~ in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the Contract. Mediation shall proceed in advance of legal or equitable proceedings, which shall be stayed pending mediation for a period of 60 days from the date of ~~filing,~~ filing unless stayed for a longer period ~~by~~ of agreement of the parties or court order.~~If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.~~

~~**§ 15.4.1** If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.~~

~~**§ 15.4.1.1** A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.~~

~~**§ 15.4.2** The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.~~

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~~**§ 15.4.3** The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.~~

~~**§ 15.4.4 Consolidation or Joinder**~~

~~**§ 15.4.4.1** Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).~~

~~**§ 15.4.4.2** Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.~~

ARTICLE 16 Contractor Accounts, Records, and Inspection

Contractor shall at all times maintain job records, including, but not limited to, invoices, payment records, payroll records, daily reports, logs, diaries, and job meeting minutes, applicable to the project. Contractor shall make such reports and records available to inspection by the Owner, Architect, or their respective agents, within five (5) working days of request by Owner, Architect, or the respective agents. Job Records must be retained by Contractor for at least seven (7) years after the date of Final Completion of the Project. Furthermore, the Contractor shall promptly provide copies, including by electronic means, of all documents that may be required by the State Public Information Act.

ARTICLE 17 Business Ethics

§ 17.1 During the course of pursuing contracts, and the course of Contract performance, Contractor and its Subcontractors and vendors will maintain business ethics standards aimed at avoiding real or apparent impropriety or conflicts of interest. No substantial gifts, entertainment, payments, loans or other considerations beyond that which would be collectively categorized as incidental shall be made to any personnel of the Owner, its Program Managers, or its Architects, or to family members of any of them. At any time Contractor believes there may have been a violation of this obligation, Contractor shall notify Owner of the possible violation. Owner is entitled to request a representation letter from Contractor, its Subcontractors or vendors at any time to disclose all things of value passing from Contractor, its Subcontractors or vendors to Owner's personnel, its Program Managers and its Architects.

§ 17.2 The Owner may, by written notice to the Contractor, cancel the Contract for Construction without liability to the Contractor if it is determined by the Owner that gratuities, in the form of entertainment, gifts, or anything of monetary value, were offered or given by the Contractor, or any agent, or representative of the Contractor, to any officer or employee of the Fort Bend Independent School District with a view toward securing a contract or securing favorable treatment with respect to the awarding, amending, or making of any determinations with the respect to the performing of such a contract. In the event the Construction Agreement is cancelled by the Owner pursuant to this provision, Owner shall be entitled, in addition to any other rights and remedies, to recover or withhold the amount of the cost incurred by the Contractor in providing such gratuities.

~~**§ 15.4.4.3** The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.~~

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_____

(Signed)

_____

(Title)

_____

(Dated)

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PART 1 GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
- A. Section includes:
  1. Project information
  2. Work covered by Contract Documents
  3. Phased construction
  4. Access to site
  5. Coordination with occupants
  6. Work restrictions
- B. RELATED SECTIONS:
  1. Division 00 FBISD Procurement Forms
  2. Division 01 Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities
  3. Division 01 Section 01 52 14 “Temporary Facilities for Students” for specifications and procedures regarding the use of temporary swing space that the Contractor may furnish and install to accommodate the Work

1.3 PROJECT INFORMATION
- A. Refer to Section 00 FBISD Procurement Forms

1.4 SCOPE OF WORK. The Work consists of:
- ~~A. New Elementary School #53 Aquatic Facility~~
- ~~B.~~A. Interior renovations to the existing Willowridge High School and new addition of a 12,00 square foot, single-story structure. ~~Design and Construction of a new elementary~~ practice pool and associated support ~~spaces: school located at the corner of Thompson Ferry Rd and Knights Ct. New construction will include classrooms, gym, library, administration, plus civil and landscape on new site.~~locker rooms, offices, ~~weight room, lobby, concessions, and restrooms. The facility is passively ventilated to perform effectively in both winter and summer. The primary structure over the pool will be a pre-engineered metal building (PEMB).~~

1.5 MULTIPLE PROJECT SITE REPRESENTATION FOR BID PACKAGES. If multiple project sites are identified in the Work, the contractor shall employ and designate one qualified full-time Superintendent who shall oversee the performance for the overall work performed under the contract. The daily work

is required to have a qualified supervisor for the duration of the work. Any deviation from this will need to be approved by FBISD and the Owner's representative.

1.6 SCHEDULE OF VALUES FOR BID PACKAGES. If multiple project sites are identified in the Work, the contractor shall provide one Schedule of Values for each project site attached to each application for payment. In addition, each school site shall have a separate schedule of values in current CSI format for Renovation Work and for Addition Work, identifying the labor and material components separately.

1.7 CONCURRENT CONSTRUCTION FOR BID PACKAGES. Work (additions and renovations) at each school site will be performed concurrently with the other school sites unless otherwise indicated by FBISD.

1.8 PHASING. If the school buildings will be in use during construction, the Work shall be conducted in such a manner as to not interrupt or disturb school activities. Phasing plans are guidelines and are used to identify a possible approach to the work. *The contractor may* submit a phasing plan for all scopes of work taking place when requested. Any deviation from the suggested plan contained in the contract documents must be approved by the A/E, owner or owner's representative, and Principal prior to implementation.

A. Temporary classroom space (Swing Space) if needed, shall be provided by the Contractor or coordinated at the campus. When Contractor is to provide temporary classroom(s), they will be responsible for all associated planning, permitting, scheduling, installation, removal, site restoration, coordination and costs associated with providing temporary space for classrooms. Temporary classroom space will be in accordance with Section 00 52 14 - TEMPORARY FACILITIES FOR STUDENTS. The Contractor may submit, as part of the proposal, optional phasing plans that can potentially save the District time and money.

B. Some work may need to be performed after normal school operating hours, nights and weekends. If an owner's representative is required outside normal hours of school operation, FBISD will incur overtime costs for FBISD staff presence at the school site, including weekends and holidays. Such overtime costs incurred may become the financial responsibility of the General Contractor and will be credited to the Owner. Determination of need for reimbursement will be made by FBISD and the owner's representative prior to the start of construction. FBISD and owner's representative reserve the right to alter the decision based on contractor performance.

C. Refer to the School Operations Parameter Statement Section for details of the regular working hours, holidays and procedures for custodial overtime, etc.

D. Work cannot start in a particular Phase until students/staff have been relocated to the designated Swing Space (either in the existing building or in Temporary Buildings outside) or until there is an arrangement in place.

1. Close coordination with the A/E, Program Manager, and the School Staff, will be required of the Contractor.

E. Some rooms within a Phase may be emptied of furniture, boxes, etc., while others may not be. This is dependent upon where the actual Swing Space will be located or any other arrangements required in the phasing plan. Protection of contents and contents moved by the contractor are the responsibility of the Contractor until work is completed.

F. The Contractor shall allow sufficient time to accommodate the Abatement Contractor's work. This activity shall be shown as a separate activity on the Construction Schedule. General Contractor shall coordinate the abatement scheduling with FBISD's selected Environmental Consultant and the Owner Representative.

G. Refer to Construction Documents for additional Phasing information.

1.9 HVAC AND WATER TREATMENT REQUIREMENTS Contractor will coordinate with FBISD for water treatment and HVAC maintenance. Please refer to the plumbing and mechanical specifications for the contractor's responsibilities related to these requirements.

1.10 PHASE ACCEPTANCE**.** Upon certification by the Contractor and recommendation of the A/E, FBISD will accept the Work of each individual phase as it is completed. Architectural acceptance shall be called "phase acceptance". The HVAC, electrical, plumbing and roofing systems will be accepted by FBISD when the entire project has been completed; at that point, upon completion of all relevant contractual requirements, Architect will issue substantial completion. The contractor will operate and maintain the HVAC, electrical and plumbing systems that are a part of his scope of work until substantial completion. The contractor's warranty for any new HVAC, electrical, plumbing and roofing systems shall commence at substantial completion for each school project, barring any deviations that have been pre-approved by owner's representative/FBISD. The contractor will install new filters and record date of replacement on each filter upon substantial completion.

1.11 USE OF TECHNOLOGY FOR PROJECT MANAGEMENT. FBISD will furnish information related to accessing web-enabled project management applications for this contract. FBISD and the owner's representative will implement project management software, Kahua, which will be easily accessible through the Internet. Contractor will cooperate with the owner's representative for the implementation and use of this tool.

Contractor will be required to create and post several types of documents into Kahua via the Internet. Request for Information (RFIs) will be posted by the Contractor and responded to by the A/E(s) in Kahua via the Internet, thereby facilitating communication among all parties and expediting resolution of issues. Any meeting minutes and field reports required to be created by the Contractor or A/E(s) will be posted to Kahua. FBISD and the Program Manager reserve the right to require additional documents to be entered into Kahua as shown below. Additional requirements may be identified.

Project Management Control System (PMCS) - Kahua

- The District and Owners Representative have agreed to use Kahua as the tool to manage projects between District, Owners Representative, and vendors (general contractors and architects).

- The following modules will be implemented:
    - Budget
    - Contracts
    - Invoices
    - Payments
    - Change Orders
    - Close Out
    - Issues
    - Meeting Minutes
    - Requests for Information
    - Submittals
    - Transmittals
    - Field Details
    - Field Work Directives
    - Punch List
    - Safety Notices

1.12 HAZARDOUS MATERIAL DESIGN AND CONSTRUCTION. FBISD has retained a separate environmental consultant to prepare contract documents including design drawings and specifications for the removal of hazardous materials from the schools and the air monitoring services (as applicable).

It shall be the responsibility of the Contractor to coordinate with the scheduled work performed by any of FBISD's separate Contractors including the hazardous materials abatement contractor. Contractor shall coordinate all aspects of the hazardous material abatement contractor's work with the Work under this Agreement. The Contractor shall always keep the Program Manager informed of all coordination issues with FBISD separate contractors. Other Contractor responsibilities in relation to the hazardous material design and construction coordination are per Article 6 of the General Contractor's Contract.

1.13 Permitting: Contractors are responsible for the costs of acquiring the building permits. The Contractor will obtain and pay for all trade permits and other miscellaneous permits that may be required by the City/County. Tap fees for connections to off-site water and sewer lines will be paid by unless specified differently by contract documents.

1.14 Storm Water Pollution Prevention Plan: Once the Notice to Proceed has been issued, the Contractor is obligated to comply with the applicable municipalities and applicable SWPPP codes and protocol. The Contractor assumes full responsibility for any complaints, citations, maintenance and complete management of the SWPPP plan including any and all documentation. For new schools with demolition scope by a separate contractor, Contractor shall coordinate with the separate contractor for a seamless transfer / transition of an existing SWPPP. Contractor will then submit all documentation to the District at closeout.

1.15 Construction Specification Index: All construction documentation will follow the 2016Construction Specification Index format.

1.16 The contractor shall tag locations of all equipment within the scope of work to comply with FBISD construction standards.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

3.1 USE OF PREMISES

A. Contractor shall coordinate work of all trades with assistance by owner's representative for all subcontractors or consultants retained by FBISD. Contractor shall sequence, coordinate, and perform the Work to impose minimum hardship on the operation and use of the existing facilities and/or Project site. Contractor shall install all necessary protection for existing improvements, Project site, property, and new Work against dust, dirt, weather, damage, vandalism, and maintain and relocate all protection to accommodate progression of the Work.
B. Contractor shall confine entrance and exiting to the Project site and/or facilities to routes approved by the Owner.
C. Contractor shall secure building entrances, exits, and Work areas with locking devices as required by the Owner.
D. Contractor assumes custody and control of Owner property, both; fixed and portable, remaining in existing facilities vacated during the work.
E. Contractor shall cover and protect surfaces of rooms and spaces in existing facilities turned over for the work, including Owner property remaining within as required to prevent soiling or damage from dust, dirt, water, and/or fumes. Contractor shall protect areas adjacent to the Work in a similar manner. Prior to Owner occupancy, Contractor shall clean all surfaces including OWNER property.
F. Within existing facilities, the Owner will remove or request the contractor to remove portable equipment, furniture, and supplies from work areas prior to the start of Work. CONTRACTOR shall cover and protect remaining items in areas of the Work.
G. Contractor is advised that school may be in session during performance of the work. Contractor shall utilize all available means to prevent generation of unnecessary noise and maintain noise levels to a minimum. When required by the Owner, Contractor shall immediately discontinue noise-generating activities and/or provide alternative methods to minimize noise generation. Contractor shall install and maintain air compressors, tractors, cranes, hoists, vehicles, and other internal combustion engine equipment with mufflers, including unloading cycle of compressors. Contractor shall discontinue operation of equipment producing objectionable noise as required by the Owner.
H. Contractor shall protect all surfaces, coverings, materials, and finished Work from damage. Mobile equipment shall be provided with pneumatic tires.
I. Contractor shall furnish, install, and maintain adequate supports, shoring, and bracing to preserve structural integrity and prevent collapse of existing improvements and/or Work modified and/or altered as part of the Work.

J. Contractor shall not use or allow anyone other than Owner employees to use facility equipment, except in an emergency.

End of Section 01 10 00

PART 1 CERTIFICATION OF COMPLIANCE

1.1 REQUIREMENTS

A. Work related to this section "Certification of Compliance" is in accordance with Texas Government Code (411.0845), Texas Administrative Code (153.1101), Texas Education Code (22.0834 & 44.034), and Board Policy (CJA).

1.2 CRIMINAL HISTORY IN GENERAL

A. Before entering into a contract with the District, a person or business must give notice to the District if the person or an owner or operator of the business has been convicted of a felony. The District may terminate a contract with a person or business if the District determines that the person or business failed to give such notice or misrepresented the conduct resulting in the conviction.

PART 2 DEFINITIONS

A. "Contracting entity" is an entity that contracts directly with the District to provide services to the District.

B. "Subcontracting entity" is an entity that contracts with another entity that is not a district to provide services to a school district.

C. "Direct contact with students" is the contact that results from activities that provide substantial opportunity for verbal or physical interaction with students that is not supervised by a certified educator or other professional District employee.

1. Contact with students that results from services that do not provide substantial opportunity for unsupervised interaction with a student or students, such as addressing an assembly, officiating a sports contest, or judging an extracurricular event, is not, by itself, direct contact with students.
2. However, direct contact with students does result from any activity that provides substantial opportunity for unsupervised contact with students, which might include, without limitation, the provision of coaching, tutoring, or other services to students.

PART 3 EMPLOYMENT / CONTRACT

A. A person who, on or after January 1, 2008, is offered employment by an entity that contracts with the District or any subcontractor of the entity must submit to a national criminal history record information review if:

1. The employee or applicant has or will have continuing duties related to the contracted services; and
2. The employee or applicant has or will have direct contact with students.

B. An entity contracting with the District and any subcontractor of the entity shall obtain all criminal history record information that relates to a person described above through the criminal history clearinghouse as provided by Government Code 411.0845.

C. A contracting entity shall require that a subcontracting entity obtain all criminal history record information that relates to a person described above.

PART 4 CERTIFICATION TO DISTRICT

A. Contractor Certification
   1. The entity and any subcontractor of the entity shall certify to the District that it received all of the criminal history record information required above. The entity and any subcontractor of the entity shall also certify that it will take reasonable steps to ensure that the conditions or precautions that have resulted in a determination that any person is not a covered contract employee continue to exist throughout the time that the contracted services are provided.

B. Sub-Contractor Certification
   1. The subcontracting entity must certify to the District and the contracting entity that the subcontracting entity has obtained all criminal history record information that relates to an employee described above at EMPLOYMENT / CONTRACT, and has obtained similar written certifications from the subcontracting entity's sub-contractors.

C. Contractor and Sub-Contractor
   1. The contracting entity and any subcontractor of the entity shall provide the District, at its request, the information necessary for the District to obtain criminal history record information for all covered contract employees.

D. COMPLIANCE WITH REQUIREMENT
   1. The contracting entity complies with the requirements of this section if the contracting entity obtains a written statement from each sub-contracting entity certifying that the subcontracting entity has obtained the required criminal history record information for employees of the subcontracting entity and the subcontracting entity has obtained certification from each of the subcontracting entity's subcontractors.

E. DISQUALIFYING CONVICTION
   1. The contracting entity shall not permit a covered contract employee to provide services at the District if the employee has a disqualifying conviction under Texas Education Code 22.085.

PART 5 CRIMINAL HISTORY RECORD INFORMATION

5.1 Each person as described above (PART 3), performing work on site under this contract (including Contractors, Project Managers and/or Job Foreman) is required to obtain a background check through the DPS criminal history clearinghouse.

5.2 The Contractor shall pay all associated processing fees for this history and clearance.

5.3 The Contractor shall, prior to commencement of any work at the site. Certify that the firm has obtained, reviewed and verified the criminal history for each person

described above (PART 3).

5.4 The contractor shall, prior to commencement of any work at the site. Certify that no person described above (PART 3) have been convicted of any offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy.

5.5 In addition the contractor shall, obtain from each Sub contractor, prior to commencement of any work at the site. Certify that the firm has obtained, reviewed and verified the criminal history for each person described above (PART 3).

5.6 In addition the contractor shall, obtain from each Sub contractor, prior to commencement of any work at the site. Certify that no person described above (PART 3) have been convicted of any offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy.

5.7 The background checks shall remain confidential in a file located in the Contractors / Sub-Contractors possession.

5.8 The Contractor shall be advised that the background checks may take longer than a week to obtain from the Texas Department of Public Safety.

PART 6 ISSUANCE OF CLEARANCE IDENTIFICATION/ACCESS BADGES

6.1 Only after an individual criminal history has been obtained, reviewed and verified by the Contractor / Sub Contractor, a badge, hardhat emblem, or other visible identification identifier should be issued to the individual.

6.2 On request by the district, the Contractor / Sub Contractor must make available to law enforcement (District Police Department) a list off all persons that a criminal history has been obtained, reviewed and verified and that have been issued clearance identification/access badges for this project.

A. SUBMITTAL

1. Submit sample Identifier for project record.

6.3 RESPONSIBILITY

A. All work and expenses required to obtain clearance identification/access badges or for other activities required in this section shall be borne by the Contractor as part of the Contract.

6.4 RULES AND REGULATIONS REGARDING IDENTIFICATION BADGES

1. Clearance identification/access badges provide access to the campus.
2. Any employee found on the campus without an -issued clearance identification/access badge will be escorted from the site and not be allowed to return until wearing a proper clearance identification/access badge.
3. All clearance identification/access badges are the property of the Contractor and must be immediately returned under the following conditions:
    a. Upon expiration; Upon separation of employment (for any reason);
    b. If convicted of, any disqualifying conviction under Texas Education Code 22.085

c. The Contractor shall immediately notify the District of personnel, Suppliers or Subcontractors whose work is terminated or completed and shall ensure badges are returned within 30 days of notification.

6.5 Escorting:

1. Any district staff, may escort any individual(s). THE ESCORT MUST REMAIN WITH THE INDIVIDUAL(S) BEING ESCORTED AT ALL TIMES WHILE ON THE SITE.
2. Escorts shall be limited to five (5) individuals, or less, depending on the circumstances to ensure positive control is maintained at all times.
3. A non-badged person can be escorted a maximum of five (5) times in a calendar year, starting the day of the first escort.

6.6 All badges that are lost, stolen, or otherwise unaccounted for must be immediately reported to the District.

6.7 Unsecured Doors: Contractors and their employees will be held accountable for doors located within their work sites that provide direct or indirect access to the campus. Doors that provide such access must NOT under ANY circumstances be left open and unattended. Individuals who have been issued Contractor badges are required to challenge any individual attempting unauthorized access to the campus.

6.8 Contractors requiring access through vehicle gates must make arrangements for access through the General Contractor/Campus.

PART 7 SPECIAL REQUIREMENTS

7.1 Each campus has specific access procedures which may include campus specific verification software and other visitor management requirements.

7.2 Coordinate and comply with each campus' requirements prior to start of work for their individual process.

PART 8 KEYS AND ACCESS CARD

8.1 Contractors that require keys and/or access card to perform work at the project site shall coordinate with the assigned FBISD Project Manager.

8.2 Keys should never be issued to Sub Contractors.

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PART 9 FORMS (attached for your use)

9.1 Certification of Criminal History Record Information Review by Contractor

9.2 Certification of Criminal History Record Information Review by Sub-Contractor

End of Section 01 14 13

CERTIFICATION OF CRIMINAL HISTORY RECORD INFORMATION REVIEW BY CONTRACTOR

Certifying Affidavit submitted to:

Name of School District: _____

Mailing Address: _____

_____

Project/Agreement: _____

STATE OF TEXAS §

COUNTY OF _____ §

(1) The undersigned representative, on behalf of the contracting firm identified below, swears and affirms to _____ Independent School District (the "District") that such firm has obtained, reviewed and verified, from a law enforcement or criminal justice agency, the criminal history record information of all employees of the contracting firm hired *before January 1, 2008*, who (i) have or will have continuing duties related to the contracted services, and (ii) have or will have direct contact with students (substantial opportunity for verbal or physical interaction with students that is not supervised by a certified educator or other professional District employee). The undersigned further certifies that no employees of the contracting firm who meet the requirements of (i) and (ii) herein have been convicted of any offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy.

(2) The undersigned representative, on behalf of the contracting firm identified below, swears and affirms to the District, that such firm has obtained, reviewed and verified, from the Texas Department of Public Safety criminal clearinghouse, the national criminal history record information of all employees of the contracting firm hired *on or after January 1, 2008*, who (i) have or will have continuing duties related to the contracted services, and (ii) have or will have direct contact with students. The undersigned further certifies that no employees of the contracting firm, who meet the requirements of (i) and (ii) herein have been convicted of any offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy.

(3) The undersigned firm swears and covenants that no present or future employee of the contracting firm, no present or future independent contractor, and no present or future employee or independent contractor of any subcontractor of the contracting firm, will provide services to the Project on a continuing basis that involve direct contact with students unless and until such employee's or independent contractor's national criminal history record information has been reviewed, cleared and certified, as required herein. In the event of an emergency, an employee or independent contractor who has not been previously certified may only provide services that involve direct contact with students if such employee is escorted by a District employee.

(4) The undersigned firm swears and covenants that, upon receipt of information, directly or indirectly, that any employee or independent contractor of the contracting firm has been convicted of an offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy, the contracting firm will immediately remove or cause the removal of such employee from the Project or scope of the Agreement and notify the District.

_____, being duly sworn, affirms and certifies that he/she is the

_____ (position) of _____ (contracting firm), and

that all statements and acknowledgements contained herein are true and correct, and that he/she has the

authority to bind such firm to the covenants set out above.

_____

SUBSCRIBED AND SWORN TO BEFORE ME this ____ day of _____, 20_____.

Notary Public _____ State of _____

My Commission expires _____

CERTIFICATION OF CRIMINAL HISTORY RECORD INFORMATION REVIEW BY SUBCONTRACTOR

Certifying Affidavit submitted to:

Name of School District: _____

Mailing Address: _____
_____

Name of Contractor: _____

Mailing Address: _____
_____

Project/Agreement: _____

STATE OF TEXAS §

COUNTY OF _____ §

(1) The undersigned representative, on behalf of the subcontracting firm identified below, swears and affirms to _____ Independent School District (the "District") and to the Contractor identified above that such firm has obtained, reviewed and verified, from the Texas Department of Public Safety criminal clearinghouse, the national criminal history record information of all employees of the subcontracting firm who (i) have or will have continuing duties related to the subcontracted services, and (ii) have or will have direct contact with students (substantial opportunity for verbal or physical interaction with students that is not supervised by a certified educator or other professional District employee). The undersigned further certifies that no employees of the subcontracting firm who meet the requirements of (i) and (ii) herein have been convicted of any offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy.

(2) The undersigned representative, on behalf of the subcontracting firm identified below, swears and covenants that no present or future employee of the subcontracting firm, no present or future independent contractor, and no present or future employee or independent contractor of any sub-subcontractor of the subcontracting firm, will provide services to the Project on a continuing basis that involve direct contact with students unless and until such employee's or independent contractor's national criminal history record information has been reviewed, cleared and certified as required herein. In the event of an emergency, an employee or independent contractor who has not been previously certified may only provide services that involve direct contact with students if such employee is escorted by a District employee.

(3) The undersigned firm swears and covenants that, upon receipt of information, directly or indirectly, that any employee or independent contractor of the subcontracting firm has been convicted of an offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy, the subcontracting firm will immediately remove or cause the removal of such employee from the Project or scope of the Agreement and notify the District.

(4) The undersigned firm further certifies that it has obtained certifications from all subcontractors whose employees (i) have or will have continuing duties related to the subcontracted services, and (ii) have or will have direct contact with students (substantial opportunity for verbal or physical interaction with students that is not supervised by a certified educator or other professional District employee), that such subcontractors have obtained, reviewed and verified, from the Texas Department of Public Safety criminal clearinghouse, the national criminal history record information of all employees of the subcontracting firm assigned to perform services to under the Project or Agreement, and that no employees have been convicted of any offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy.

_____, being duly sworn, affirms and certifies that he/she is the _____ (position) of _____ (contracting firm), and that all statements and acknowledgements contained herein are true and correct, and that he/she has the authority to bind such firm to the covenants set out above.

_____

SUBSCRIBED AND SWORN TO BEFORE ME this ____ day of _____, 20_____.

Notary Public _____ State of _____

My Commission expires _____

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. Refer to the AIA A201 General Conditions and the Supplementary Conditions for additional requirements concerning allowances. If necessary additional requirements will be issued by Change Order (CO).

1. Allowances shall cover the cost to the Contractor of materials, all labor costs, and equipment delivered at the site, overhead, profit, bonds, insurance and all applicable taxes, less applicable trade discounts.
2. PCO (Potential Change Order) will be issued by the A/E via Kahua (Potential Change Order Module) to document and gain authorization to utilize allowance on a particular campus for items not covered in the original contract scope of work.
3. AEA (Allowance Expenditure Authorization) is used for authorization and tracking of use of contract allowances. A separate AEA series is used for each defined allowance.
4. Any needs beyond the means of the contract shall require Change Order(s).
5. CAEA (Contingency Allowance Expenditure Authorization) shall only be used for necessary work authorized by the District and in addition to the contracts defined scope of work or to credit work deleted from the contract as authorized by the District.
6. The contingency allowance (if provided) is not an entitlement to the GC. Unused portions shall be removed from the contract via a final Change Order during contract closure.
7. A CO is only used when no other funding sources are available within the contract and contract value must be increased.
8. A CO is the only method for adding funding or to change the contract work or time (when funding from the contingency allowance included in the Contract is depleted).Types of allowances include the following:
    a. Types of allowances include the following:
        i. Lump-sum allowances.
        ii. Unit-Cost allowances
        iii. Quantity allowances
        iv. Contingency allowances.
        v. CSI Division allowances

B. Related Sections:

1. Division 00 Competitive Sealed Proposal Form - Base Bid.
2. Division 01 Section "Unit Prices" for procedures for using unit prices.
3. Divisions 02 through 49 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

A. Contractor shall advise Architect and owner's representative of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work. All specific allowance scope shall be included in the schedule provided by the contractor.
B. At Architect's or Program Manager's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
C. Once the proposal is approved by the Owner, purchase products and systems selected by the Architect.

1.4 SUBMITTALS

A. Submit proposals for approval of purchase of products or systems included in allowances, in the form specified for Contingency Allowance Expenditure Authorization (CAEA), Allowance Expenditure Authorization (AEA), or as specified in Change Order.
B. Submit all necessary backup per the contract requirements for approval of PCOs and AEAs.
C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Owner's Contingency
   1. Allowance Amount: To be determined.

End of Section 01 21 00

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Sections:

1. Division 00 Competitive Sealed Proposal Form – Alternates and Unit Pricing.
2. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
3. Division 01 Section "Quality Requirements" for general testing and inspecting requirements

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract documents are either increased or decreased.

1.4 PROCEDURES

A. A Unit Price is a cost for a unit of work, as described in the Proposal Documents. The Owner may add or deduct Unit Price work at the amounts stated on the Proposal Form and such amounts shall not be subject to additional mark-up by the Contractor or his Subcontractors.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. If the quantities of the items listed in the Schedule of Unit Prices are increased, the Unit Prices set forth by the Contractor shall apply to such increased quantities. Unit Prices for adjusting the Contract Sum for less work or material installation will be 95% of these amounts.

PART 2 PART 2 - PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

End of Section 1 22 00

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by Proposers and stated on the Proposal Form for certain work defined in the Proposal Requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the total addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum. Pricing for alternates may not be submitted or listed in the form of an allowance amount on the proposal form.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
2. Cost listed for each Alternate includes cost of related coordination, modification or adjustment.

B. Notification: Immediately following award of the Contract, Contractor shall prepare and distribute to each entity or person to be involved in the performance of the Alternate Work, a notification of the status of each Alternate scheduled herein. Indicate which alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates if any.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Contractor shall be responsible for any changes in the Work affected by acceptance of Alternates. Claims for additional costs or time extensions resulting from changes to the Work as a result of the Owner's election of any or all Alternates will only be considered if it is a deferred for later consideration.

E. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No 1: Base Bid Adjustment

B. Alternate No 2: Deviations Request Form: If bidder proposes to use any substitutions or deviations from the base bid, use Alternate No. 2 via the Deviations Form in Document 00 21 13 Instructions to Bidders.

C. Alternate No. 3: Water Cooled Chillers (CH-1 and CH-2):
   1. Base Bid: Provide water cooled chillers as manufactured by Carrier.
   2. Alternate 3A: Provide water cooled chillers as manufactured by JCI
   3. Alternate 3B: Provide water cooled chillers as manufactured by Daikin.

D. Owner to select one of the following six alternates (4A through 5C) during bidding negotiations:
   1. Alternate No. 4: Air Cooled Chiller (ACCH-4):
      a. Alternate 4A: Provide air cooled chiller as manufactured by Carrier.
      b. Alternate 4B: Provide air cooled chiller as manufactured by JCI
      c. Alternate 4C: Provide air cooled chiller as manufactured by Daikin.
   2. Alternate No. 5: Air Cooled Chillers at Auditorium:
      a. Alternate 5A: Replace existing air cooled chiller (ACCH-3E) currently servicing the Auditorium with two new air cooled chillers (ACCH-3ALT and ACCH-4ALT) manufactured by Carrier.
      b. Alternate 5B: Replace existing air cooled chiller (ACCH-3E) currently servicing the Auditorium with two new air cooled chillers (ACCH-3ALT and ACCH-4ALT) as manufactured by JCI.
      c. Alternate 5C: Replace existing air cooled chiller (ACCH-3E) currently servicing the Auditorium with two new air cooled chillers (ACCH-3ALT and ACCH-4ALT) as manufactured by Daikin.

E. Alternate No. 6: Walkway Lighting in Auditorium
   1. Provide new theater walkway lighting in lower level of Auditorium. Remove 56 existing end panels and replace with new Irwin LED beacon light end panels.

F. Alternate No. 7: New Cloud Ceiling in Auditorium
    1. Remove existing ceiling cloud in Auditorium and replace with new painted gypsum board cloud ceiling system. Add new light fixtures, speakers, and sprinkler head diffusers to accommodate revised layout of new ceiling cloud system. Refer Reflected Ceiling Plans and Electrical Sheets on Drawings.

G. Alternate No. 8: Updated Theater Lobby Finishes
    1. Provide new theater lobby finishes including paint, resilient tile flooring, acoustical ceiling panels, and rubber base. Estimated quantities of each material include:
        a. Flooring: 4,200 square feet.
        b. Resilient Base: 475 square feet.
        c. Paint: 6,000 square feet.
        d. Acoustical Panel Ceilings: 3,700 square feet.
    2. Refer to Specifications, Architect's Master Schedule, Finish Plans, and Reflected Ceiling Plans.

H. Alternate No. 9: Elevator #2
    1. Alternate 9A: Replace passenger elevator #2. Reference Section 14 24 00 "Hydraulic Elevators."
    2. Alternate 9B: Provide passenger elevator #2 modernization in lieu of replacement. Reference Section 14 27 00 "Elevator Renovation."

I. Alternate No. 10: Air Handling Unit at Field House
    1. For increased humidity control in the existing field house, provide roof-mounted Packaged DX Dedicated Outdoor Air Unit to supply outside air to the field house air handling units.
    2. Remove intake fan, IF-1. Locate dedicated outdoor air unit on roof and duct OA into existing OA duct in building. Dedicated outdoor air unit shall be a York model JROA, 8080 CFM outdoor air supply, 763 TMBH/383.9 SMBH, 98 DB/80 WB entering coil, 51.4 DB/51WB leaving coil unit with variable capacity compressors and modulating hot gas reheat.
    3. Coordinate with Electrical for supply of a 460v/3 Phase, 150.2 MCA/175 MFS electrical connection to unit.
    4. Coordinate with Structural for steel required to support approximately 8500 lb unit. Unit shall be controlled by packaged controls, and the existing BAS shall schedule the unit on/off.

End of Section 01 23 00

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections:

1. Division 01 Section "Allowances" for products selected under an allowance.
2. Division 01 Section "Alternates" for products selected under an alternate.
3. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
4. Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor and Owner.

1.4 SUBMITTALS

A. Substitution Requests: General Contractor to submit a copy of each request for consideration to be reviewed by A/E and owner. Identify product or fabrication or installation method to be replaced. Include related Specification Section number and title, Drawing numbers and titles and complete documentation for substitution Include the following information with each request:

1. Certification by the Contractor to the effect that, in the Contractor’s opinion, after thorough evaluation, the proposed substitution will result in work that in every significant respect is equal to or better than the work required by the Contract Documents, and that it will perform adequately in the application indicated.
   a. Include in a certification the Contractor’s waiver of right to additional payment or time, which may subsequently be necessary because of the failure of the substitution to perform adequately.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    e. Samples, where applicable or requested.
    f. Certificates and qualification data, where applicable or requested.
    g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, where applicable or requested.
    h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated, where applicable or requested.
    i. Research reports evidencing compliance with building code in effect for Project, from IBC, where applicable or requested.
    j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
    k. Cost information, including a proposal of change, if any, in the Contract Sum
3. Acceptance of substitutions will be delivered in writing by A/E, owner’s representative or owner. Upon acceptance contractor will follow Section 01 33 00 Submittal Procedures and/or CSI division specifications for accepted substitutions.
4. Substitutions may be considered only when specified product or material is no longer available in the market; or if the product or

material provides a better value to the Owner and is within, or less than the project budget.

5. This Substitution procedure is not allowed during the Procurement Phase.
6. During the Construction Phase, all substitutions proposed by the GC shall be approved in writing by the A/E and the Owner.
7. Approval: If necessary, Architect will request additional information or documentation for evaluation within a reasonable amount of time from receipt of a request for substitution. Architect will recommend to the owner's representative acceptance or rejection of proposed substitution within a reasonable amount of time from receipt of all required documentation. Owners' representative will recommend to the District acceptance or rejection of proposed substitution within a reasonable amount of time from receipt of all required documentation. Upon recommendation from the owner's representative, the District will provide acceptance or rejection of proposed substitution within a reasonable amount of time from receipt of all required documentation.
    a. Forms of Acceptance: Owner Provided Substitution Request Form, which can be attached to any of the following (as applicable): Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work with Design Manager and Owner written approval.
    b. Rejection will include a statement giving reason for rejection from AE or Owner's representative.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.
B. The Owner may not consider the request if the Contractor cannot provide the product or method because of failure to pursue work promptly or coordinate activities properly.

PART 2 PRODUCTS

2.1 SUBSTITUTIONS

Approval process for both types of substitutions shall be as described above.

A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than fifteen (15) days prior to time required for preparation and review of related submittals.
    1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return

requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

A. Substitutions for Convenience: Architect will consider requests for substitution if received within twenty (20) days after the Notice to Proceed. Requests received after that time may be considered or rejected at the discretion of Architect, only when there is an advantage to the Owner.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities that Owner may assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted via Owner provided Substitution Request Form.
e. Requested substitution may not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.

j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. System Substitution: No changes should be anticipated in major building system types or approved manufactures in pricing of schedule; the Owner has standardized materials in place in existing buildings, and will not change for the convenience of the contractor.

PART 3 - **EXECUTION (Not Used)**

PART 4- **FORMS (attached for your use)**

4.1 Substitution Request Form

End of Section 01 25 00

Substitution Request

(Must be submitted within 15 days after date of contract, unless special circumstances exist)

To: Carolina Fuzetti – Executive Director Design and Construction Date: _____

AE Firm: _____ Project Manager: _____

BP #: ____ Org No: _____ Project Name: _____

Submission #: _____ Contractor: _____

Project Type: ___ Addition ___ Renovation ___ New Construction

SUBSTITUTIONS MUST BE ORIGINATED BY CONTRACTOR & EVALUATED BY A/E / DESIGN AND CONSTRUCTION PRIOR TO SUBMITTAL TO BOND OFFICE.

Description of Substitution:

_____

Reasons for Request: (specified product no longer available, extended warranty, lower initial cost, reduced maintenance cost, better quality, available immediately, schedule improvement, other): _____

_____

_____

Credit due to District, if any: $_____.
Reduced Contract Time, if any: _____ days

Product Listing Schedule: (Attach any required documentation)

Related unit-of-work Specifications Section #	
Generic name as used in the Contract Documents	
Proprietary name, model number, and similar product designation	
Prime Contractor Name / Phone #	
Sub-Contractor Name / Phone #	
Rationale: (Why is change needed?)	
Features & Benefits: (What is the benefit to FBISD?)	

Potential Issues: (What are the drawbacks or negative impacts?)	
Construction Impact: (What is the potential impact to cost or schedule?)	
O&M Impacts: (What are the potential impacts to parts & labor maintenance cost, spare parts inventory, and current maintenance practices?)	
Utility Cost Impact: (What is the potential impact on electric, gas and water utility consumption and cost to FBISD?)	
Drawing #	

Contractor's Certification:
In the Contractor's opinion, after thorough evaluation, the proposed substitution will result in work that in every significant respect is equal to or better than the work required by the Contract Documents, and it will perform adequately in the application indicated. The Contractor waives the rights to additional payment or time, which may subsequently be necessary because of the failure of the substitution to perform adequately.

_____

_____

General Contractor's or Representative Signature Date

	APPROVED	REJECTED	DATE	REASON
A/E's Recommendation (within 2 wks. of receipt)				
FBISD Facilities Recommendation				

Pending Information Noted below:

Final Response to Substitution Request: _____ Approved _____ Not Approved

_____

District Representative Date

_____

Project Manager Date

_____

Design Manager Date

Refer to Specifications Section 01 60 00 for additional provisions and GC Agreement 3.4.2.1 and 3.5.1.

A/E, PM and/or District are not authorized to waive any code requirements. If the Request is approved, when signed by the District and Project Manager and received by the Contractor, this document becomes effective immediately as a FBISD Approved substitution and the GC Firm shall proceed with the change(s) described above. If the Request is not approved, no changes can be implemented

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections:

1. Changes to the Contract may involve close coordination between this Section and Section listed below. Retain Section in subparagraph below that contains requirements Contractor might expect to find in this Section but are specified in other Sections.
2. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.4 PROPOSAL REQUESTS –

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

B. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change without Owner approval

C. Within time specified in Proposal Request or five (5) days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

1. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
2. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
3. Include costs of labor and supervision directly attributable to the change.
4. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

D. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to the Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.5 CHANGE ORDER PROCEDURES

A. The A/E will issue a work change proposal request using the district's program management information system (PMIS). A potential change order (PCO) will be issued in the PMIS under the PCO module. The contractor will upload all appropriate backup per the requirements in the AIA 201 under section 7. Upon execution of workflow and approval of the PCO the contractor will be provided approval via email or PMIS notification and work can begin. A CO will be issued at a later date to be agreed upon by A/E, contractor and owner's representative.
   1. Construction - PCOs: This category is used to capture any Potential Change anticipated during the life of the projects. All AEA's, CAEA's, and COs are initiated with a PCO as well as any potential item identified by the owner's representative that may end up being voided.
   2. PCOs Reports: Several Prolog Report are available. The categorization established allows reports to be provided for specific categories depending on the request or the audience.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

C. PROCESS:

1. CCDs will be issued by the A/E via Prolog (Potential Change Order Module) and the documents will be signed via DocuSign.
2. The Project Team will review the GC Construction Schedule for evidence of potential time impact to the Construction Schedule, contract or related contracts. The GC will be required to demonstrate that the change impacts specific critical activities in the overall schedule, and to what extent. Determination of impact to fees and other costs resulting from schedule delays to be provided to owner's representative and the District for review, approval or rejection.
3. The Project Team will conduct a CPM review, and may include preparation of independent fragment analysis where necessary to verify the criticality of the proposed changed work.
4. The PMT may produce a partial CPM schedule that displays any significant time impact of the proposed change for further analysis.
5. The PMT will keep these analyses confidential in a restricted access file.
6. The GC will be required to prepare recovery schedules to minimize delays.
7. Negotiations: The PM will schedule and coordinate the negotiation sessions. Attendees will include the GC, the representatives from the District, the PM and A/E.
8. The Negotiation Team will meet with the GC with the intent to negotiate an agreement. The number of negotiating sessions will be based on the complexity of the issues and the scope of the change.
9. If there is no agreement with the GC during negotiations, and it is determined that the Change is required, the A/E will prepare an AIA Form G714 Construction Change Directive (CCD).
10. If there is an agreement, the A/E will initiate a CO as appropriate.
11. The PM will monitor all CCDs and report the status to the District.
12. Document Control collects required signatures via DocuSign, ensures that files are saved electronically and files the original CCD in the hardcopy files.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

End of Section 01 26 00

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Provisions established within the General, Supplementary and Other Conditions of the Contract, Division 1 – General Requirements, and Drawings are collectively applicable to this Section.

1.2 REQUIREMENTS

A. By the 25th of the month, the Project Manager (PM), the Architect (A/E), and the General Contractor (GC) meet to conduct a quality control of the current month Payment Application with attachments.

B. The A/E and PM perform visual observations of the work in order to verify GC estimates of job progress, including verification of stored materials in bonded warehouses. The GC, PM and A/E meet to determine appropriate percentages of completion on all items on the Schedule of Values (SOV).

C. Upon agreement by the PM and A/E, the GC submits Payment Application (Pay App) in District approved format via Kahua, as per GC Agreement with all necessary supporting material. The GC includes any required back-up documents (PDF format) to substantiate work completed, at minimum: SOV, Monthly Schedule with baseline, SBE report.

D. The A/E reviews the pay application. If there is need for clarification or additional information, the A/E discusses with the GC and obtains the needed information. Upon approval, the A/E approves certifies the Pay Application (Pay App) and approves the workflow in Kahua and notifies PM (via workflow). If the Pay App is not approved, the A/E sends it back to the GC for resubmission.

E. The PM reviews the pay App. If not approved, sends back to GC for resubmission. If the workflow is approved, Kahua workflow notifies District's Design & Construction (D&C) Construction Manager for review.

F. D&C Construction Manager reviews and approves the Pay App in Kahua, notifies Controls Manager via Kahua workflow. If the Pay App is not approved, Construction Manager sends Pay App to PM for resubmission.

G. Controls Manager reviews and approves the Pay App in Kahua, notifies District's Design & Construction (D&C) Director. If the Pay App is not approved, Controls Manager sends Pay App to PM for resubmission.

H. The District's D&C Executive Director approves the Pay App in Kahua and notifies D&C Budget Accounting Associate (via workflow). If not approved, send Pay App to PM for resubmission.

I. D&C Accounting Associate reviews and inputs Pay App in PeopleSoft. If not approved send Pay App back to PM for resubmission. If approved send to District's accounting for processing.

J. District's Accounting processes payment to GC in People Soft and notifies GC. Checks are cut on Tuesdays and Thursdays and issued via Automated Clearing House (ACH) system for electronic checks transfer.

K. Wednesday and Friday the GC receives payment.

1.3 RELATED SECTIONS/DOCUMENTS

A. General Conditions: Progress Payment, and Final Payment.

B. Section 013300 – Shop Drawings, Product Data and Samples

C. Section 012973 – Schedule of Values
D. Section 013120 – Small Business Enterprise Procedure

1.4 FORMAT
A. AIA G702 – Application and Certificate for Payment
B. For continuation sheet, use AIA G703 in format at Section 012973 for schedule of values.

1.5 PREPARATION OF PAY APPLICATIONS
A. Type required information or use media printout.
B. Execute certification by authorized officer.
C. Use data on approved Schedule of Values. Provide dollar value in each column for each line item for portion of Work performed and for products.
D. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for original item of Work.
E. Prepare one application with a schedule of values for each school with a breakdown in the current CSI format. Payment Application format may be provided by the PM.
F. Each school shall have a separate schedule of values for Renovation Work and for Addition Work.

1.6 SUBMITTAL PROCEDURES
A. Schedule meeting (20) days prior to submitting first pay request, to review schedule with Architect and Project Manager.
B. Submit one (1) original copy of each Application for Payment at times stipulated in Agreement.
C. Submit Pay Application via Owners designated software (Kahua). Include with the submission:
1. G702, G703
2. SBE Utilization Report
3. Contractor Release of Liens
4. Sub-contractor Release of Liens
5. Projected Contractor Invoicing schedule (Cashflow) for the next 6 months
6. Updated construction schedule (complying with contract dates)
D. Payment Period: Submit at intervals stipulated in the Agreement.

1.7 SUBSTANTIATING DATA
A. When Architect requires substantiating information, submit data justifying line item amounts in questions. On Owner controlled allowance items, submit actual invoices from supplier of product or service.

1.8 FORMAT AND SUBMITTAL REQUIREMENTS
A. Set-up format and submittal requirements include but are not limited to the following:
1. Contractor must use AIA G702 and AIA G703 forms for Application for Payment or form provided by PM.
2. All values should be taken to the hundredth (dollar).
3. All items must be broken down by school, by addition/renovation (where applicable). This break down must

match the breakdown as specified in the GC Contract or established with the Program Manager.

4. All items must be organized by the current CSI division.
5. All items must be broken down by material and labor.
6. All applicable current CSI divisions must be sub-totaled.
7. Each addition/renovation (where applicable) and school must be sub-totaled.
8. The Owner's Contingency Allowance (O.C.A.) should occupy one line item at the bottom of each addition/renovation and match the amount specified in the GC contract. This line item should be separated from any other CSI division.
9. All other contract allowances (pre-bid or post-bid) should be specified per the GC contract.
10. General Conditions, P&P Bonds, Insurances, Fees, Building Permits, Mobilization, and De-mobilization must be identified.

B. Post-set-up format and submittal requirements include but are not limited to the following:

1. Contractor may not change the "scheduled values" after approval of the Schedule of Values (SOV) by the A/E, PM, and FBISD (at first Application for Payment).
2. Include FBISD P.O. number on AIA G702.
3. Include FBISD P.O. number in application number. For example, "222123-3" would be the third Application for Payment for P.O. 222123.
4. Certified by A/E.
5. Previous invoice totals match previous invoice.
6. Attach an SBE Pay Sub Contractor/Sub Consultant Utilization Report, signed or acknowledged by e-mail or waiver by all SBE subcontractors. (Acknowledgment must include amount paid during current period.)
7. Attach an SBE Pay Sub Contractor/Sub Consultant / Suppliers Payment Certification Form, signed or acknowledged by e-mail or waiver by all SBE subcontractors. (Acknowledgment must include amount paid during current period.)
8. Attach a schedule for each project, updated for the billing period, with Substantial Completion dates per GC contract or applicable CO.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

End of Section 01 29 00

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Provisions established within the General, Supplementary and Other Conditions of the Contract, Division 01 – General Requirements, and the Drawings are collectively applicable to this Section.

1.2 REQUIREMENTS INCLUDED

A. Procedures for preparation and submittal of Schedule of Values (SOV).

1.3 RELATED SECTIONS/DOCUMENTS

A. General Conditions.
B. Section 01 29 00 – Payment Procedures.

1.4 FORMAT

A. Print SOV on AIA Documents G703 – Continuation Sheet for Application and Certificate for Payment.
B. Follow Table of Contents of Project Manual for listing components parts. Identify each line item by number and title of major Specifications Section.

1.5 CONTENT

A. Using the current Master Format™ Edition, in CSI format, each school shall have a separate SOV for Renovation Work and for Addition Work, as applicable.
B. In CSI format, list installed value of each major item of Work to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar. All values should be taken to the Dollar.
C. List Owner Controlled Contingency Allowance and other allowances with the specified monetary amount for each allowance in separate divisions.
D. Contractor to use separate lines for bonds, insurance, temporary facilities and controls, superintendents, mobilization, and demobilization. Each item shall include prorated portion of overhead and profit.
E. Provide line item for safety on the SOV.
F. Provide line item for closeout on the SOV.
G. The sum of the values listed shall equal total Contract Sum.

1.6 SUBMITTAL

A. GC prepares and submits a SOV timely prior to the submittal of the first pay application and that the A/E and PMT reviews and responds prior to the approval of the first pay application.
B. Upon resolution of issues, the PM is responsible for providing a letter accepting the SOV.
C. Payment against the approved SOV is based on earned value which is derived from the status of the construction as observed by the A/E and PM.
D. Submit a copy via Kahua transmittal of the SOV within ten (10) days of award of contract and prior to Pre-Construction Meeting or first pay application.
E. Identify Project by title and number.

F. Secure the A/E and owner's representative (PM) approval of the SOV prior to submitting the first Pay Application.
G. The activities on the SOV are to reflect construction by area or phase.
H. Breakdown all costs into equipment, materials, and labor.

1.7 SUBSTANTIATING DATA

A. When the A/E or the PM requires substantiating information, submit data justifying line item amounts in question.
B. Provide one (1) copy of data with cover letter for each copy of Pay Application. Show Pay Application number and date and line item by number and description.

PART 2 PRODUCTS (Not Applicable)

PART 3 PART 3 – EXECUTION (Not Applicable)

End of Section – 01 29 73

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, specifications, and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General project coordination procedures.
   2. Administrative and supervisory personnel.
   3. Requests for Information (RFIs).
   4. Project meetings.
   5. Closeout Procedures

B. Related Sections:
   1. Division 01 Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2. Division 01 Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Pre-installation conferences.
   7. Project closeout activities.
   8. Startup and commissioning of systems.

1.5 KEY PERSONNEL

A. Key Personnel Names: Within ten (10) days following Notice to Proceed, submit a list of key personnel per submittal procedures in 01 33 00, including superintendent and other personnel in attendance at Project site. Identify individuals; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses.
   1. Post copies of list in project meeting room, in temporary field office, in construction safety manual, and provide copies electronically to AE, owner’s representative or others upon request. Keep list current at all times.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified using the Program Manager’s electronic project management software.
   1. Architects will respond to RFIs that are initiated by the contractor and not by other entities controlled by Contractor.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
   3. Contractor uses the RFI to request direction and/or clarification resulting from, but not limited to the following:
      a. Conflicts, omissions, ambiguities, or discrepancies within the

Contract Documents
b. Conflicts between the Contract Documents and any provision of code or regulation applicable to the performance of the work
c. Conflicts between the Contract Documents and any standard specification or instruction of a manufacturer
d. Conflicts with differing existing conditions.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor’s signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form generated using Owner’s designated software with substantially the same content as indicated above.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received on the following working day.
1. The following RFIs will be returned without action:
a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for coordination information already indicated in the Contract Documents.
d. Requests for adjustments in the Contract Time or the Contract Sum.
e. Requests for interpretation of Architect's actions on submittals.
f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing via the owner's designated software within seven (7) days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit on a weekly basis a log of RFI's organized by the RFI number. The log should be generated using the Owner's designated software.

1.7 PROJECT MEETINGS

A. Preconstruction Conference: Architect and Project Manager will schedule and conduct a preconstruction conference at the earliest possible date after the execution of the Agreement and before starting construction, at a time convenient to Owner, PM and Architect.
    1. Purpose of the conference will be to review responsibilities and personnel assignments.
    2. Attendees: Authorized representatives of Owner, PM, Architect, and their consultants; Contractor and its superintendent; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
    3. Agenda: Discuss items of significance that could affect progress, including any or all of the following:

        a. Introductions
        b. Submission of Post Proposal Information if any outstanding
        c. Tentative Construction schedule.
        d. Meetings: dates, locations, attendees, types, agendas
        e. Communication: Owner's representative electronic project management software, correspondence flow
            1) Lines of communications
        f. Schedule:

1) Phasing
2) Critical work sequencing and long-lead items

g. Designation of key personnel and their duties
h. Procedures for processing field decisions and Change Orders
i. Procedures for RFIs
j. Consultant / Lab Notification Requirements
1) HazMat
2) Roofing
3) Envelope
4) Test & Balance
5) Materials Testing
6) Commissioning
7) Other Inspections as applicable.
k. Procedures for processing Applications for Payment
1) AIA G702 and G703 (Schedule of Values)
2) Cash flow
3) Updated Schedule
4) AE Review
5) SBE
l. Distribution of the Contract Documents.
m. Submittal procedures.
n. Preparation of record documents.
o. Use of the premises and existing building
p. Work restrictions.
q. Working hours.
r. Owner's occupancy requirements.
s. Responsibility for temporary facilities and controls.
1) Site access
2) Signage
3) Dumpsters
4) Fencing
5) SWPPP
6) Parking availability
7) Office, work and storage areas
8) Equipment deliveries and priorities
t. Procedures for disruptions and shutdowns.
u. Safety
1) Emergency Contact List
2) First aid.
3) Site Security.
v. Progress cleaning.

4. Minutes: Architect will record and distribute meeting minutes using the Program Manager's electronic project management software.

B. Progress Meetings: The architect and the Project Manager will schedule and administer progress meetings at weekly intervals.
   1. Contractor shall make physical arrangements at site for the progress meetings.
   2. Location of meetings: Contractor's field office, unless agreed upon mutually by the Architect, Contractor and PM.
      a. Determine at the Pre-construction Meeting if space in the existing facility or facilities is available for meetings.
      b. For multiple school Bid Packages, weekly progress meetings will be held at each school site on a rotating basis. Site specific meetings will be held at the discretion of the PM.
   3. AE will prepare agenda, distribute notice of the meeting, PM will preside at meetings. AE will record minutes and distribute copies within five (5) days after meeting to participants, and to entities affected by decisions at meetings. Distribution will come from owner's software or email.
   4. Coordinate dates of meetings with preparation of payment requests.
   5. Attendees:
      In addition to representatives of Owner, Owner's representative, Professional Consultants, as appropriate to the agenda, and Architect, each contractor, job superintendent, subcontractor, supplier, and other entities as appropriate to the agenda shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
   6. Agenda will contain some or all of the content below:
      a. Review and correct or approve minutes of previous progress meeting.
      b. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
         1) Safety (lost time, accidents, violations, etc.)
         2) Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time including PCOs.
            a) Review schedule for next period.

3) New Business (Field observations, problems, decision, identification of problems which impeded planned progress, non-confirming work, etc.)
4) RFI's and RFI log review
5) Submittals and submittal log review
6) PCOs, CAEAs and related log reviews
7) Review of draft Application for Payment, as necessary.
8) For new schools: LEED Certification status and strategy.

c. Review present and future needs of each entity present, including the following:
1) Interface requirements.
2) Sequence of operations.
3) Access.
4) Site utilization.
5) Temporary facilities and controls.
6) Progress cleaning.
7) Quality and work standards.
8) Status of correction of deficient items.
9) Field observations.
10) Pending claims and disputes.

7. Minutes: Using the Owner's designated software, the entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Owner, PM, and Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following as applicable:
a. Contract Documents.
b. Related RFIs.
c. Submittals.
d. Review of mock-ups.
e. Possible conflicts.

f. Compatibility problems.
g. Time schedules.
h. Weather limitations.
i. Manufacturer's written recommendations.
j. Warranty requirements.
k. Compatibility of materials.
l. Acceptability of substrates.
m. Space and access limitations.
n. Testing and inspecting requirements.
o. Installation procedures.
p. Coordination with other work.
q. Required performance results.
r. Protection of adjacent work.
s. Protection of construction and personnel.
t. For new schools: LEED Certification status and strategy.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions. The meeting minutes will be documented by the GC.
4. Reporting: GC shall distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Reinstallation Conference: When required in individual Specification Sections, convene a reinstallation conference at work site prior to commencing work of the section.
1. Require attendance of entities directly affecting or affected by Work of the Section.
2. Notify Owner, PM and Architect at least seven (7) days in advance of meeting date.
3. GC shall prepare agenda, preside at conference, record minutes, and distribute copies within five (5) days after conference to participants.
4. Review conditions of reinstallation, preparation and installation procedures, and coordination with related work.

E. Project Closeout Conference: Schedule and conduct a Project closeout conference, at a time convenient to Owner, Owner’s representative and Architect, but no later than thirty (30) days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Owner's representative, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following: Preparation of record documents.
   a. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
   b. Submittal of written warranties.
   c. Requirements for preparing operations and maintenance data.
   d. Requirements for demonstration and training.
   e. Preparation of Contractor's punch list.
   f. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
   g. Submittal procedures.
   h. Responsibility for removing temporary facilities and controls.
   i. Review of General Contractor Close Out Checklist (see Part 3 – Execution)
   j. Commissioning
   k. Testing and Balancing.
4. Minutes: Architect will record and distribute meeting minutes using the Owner's designated software.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 The General Contractor Close-out checklist will be completed by the owner's representative, architect, and general contractor. A copy will be submitted with the substantial completion AIA G704 and the certificate of final completion. The checklist can be found under section 01 77 00.

End of Section 01 31 00

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements necessary for coordinating Work operations including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.

1.2 RELATED REQUIREMENTS

A. Section 01 32 16: Construction Schedule.
B. Section 01 33 00: Submittal Procedures.
C. Section 01 45 23: Test and Balance and Commissioning for HVAC.
D. Section 01 77 00: Contract Closeout.

PART 2 PRODUCTS (Not used)

PART 3 EXECUTION

3.1 COORDINATION

A. Contractor shall coordinate operations included in various sections of Contract Documents to assure efficient and orderly installation of each part of Work. Coordinate Work operations included under related sections of Contract Documents that depend on each other for proper installation, connection, and operation of Work, including but not limited to:
   1. Schedule construction operations in sequence required where installation of one part of Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
   3. Provide provisions to accommodate items scheduled for later installation.
   4. Prepare and administer provisions for coordination drawings.
B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required in notices, reports, attendance at meetings, and:
   1. Prepare similar memoranda for Owner and Separate Work Contract where coordination of their Work is required.
C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of Work. Such administrative activities include, but are not limited to, following:
   1. Preparation of schedules.
   2. Installation, relocation, and removal of temporary facilities.
   3. Delivery and processing of submittals.
   4. Progress meetings.
   5. Project closeout activities.

D. Conservation: Coordinate Work operations to assure operations are carried out with consideration given to conservation of energy, water, materials, and:
    1. Salvage materials and equipment involved in performance of, but not actually incorporated into Work.

3.2 SUBMITTALS

A. Coordination Drawings: Contractor shall prepare coordination drawings to coordinate the installation of products and materials fabricated, furnished and installed by separate entities, under different parts of the Contract. Contractor shall notify Owner and Architect of all major conflicts in writing in a timely manner so that the design team can respond without construction delays. Coordination drawings shall address the following at a minimum:
    1. Limitations in available space for installation or service. Contractor shall overlay plans of each trade and verify space requirements and conflicts between trades. Minor changes and adjustments that do not affect design intent shall be made by Contractor and shall be highlighted for Architect's review.
    2. Incompatibility between items provided under different trades (such as difference in voltage between equipment specified under Divisions)
    3. Inconsistencies between drawings, specifications and codes (between trades and within each trade).
    4. Additional items required for existing facilities construction projects shall be designed and prepared from available as-built drawings that are verified through non-invasive and non-destructive, visual observation only. Contractor shall field verify actual existing conditions during and upon completion of demolition work and incorporate findings into preparation of co-ordination drawings. Minor changes and adjustments that do not affect design intent shall be made by Sub-Contractor and shall be highlighted for Owner and Architect's reviews.
B. Prepare coordination drawings in CAD with each trade on a separate layer, in specified color and scale. Contractor and each Subcontractor shall provide and forward reproducible copies and CAD drawing files in the order described here:
    1. Structural shop drawings shall indicate location and sizes of columns, beams and other structural members, as well as wall, roof and slab penetrations, and will be provided to mechanical, electrical, low voltage and plumbing Sub-contractors for co-ordination. Structural items shall be indicated using black lines.
    2. HVAC Subcontractor will indicate all ductwork, piping and equipment complete with installation and dimensioned service clearances, duct and pipe sizes, fitting types and sizes, top or bottom of duct and pipe elevations, distances of ducts, pipes and equipment from building reference points and hanger and support locations. Minor changes and adjustments that do not affect design intent shall be made by Subcontractor and shall be

highlighted for Owner and Architect's reviews. Forward drawings to plumbing, electrical and low voltage Subcontractor for further coordination. HVAC items shall be indicated using orange lines.

3. Plumbing Subcontractor will indicate all plumbing lines, and equipment complete with installation and dimensioned service clearances, pipe sizes, fitting types and sizes, top or bottom of pipe elevations, distances of pipes and equipment from building reference points and hanger/support locations. Coordinate with HVAC Subcontractor. Minor changes and adjustments that do not affect design intent shall be made by Sub-contractor and shall be highlighted for Owner and Architect's reviews upon completion drawings shall be forwarded to Fire Sprinkler Subcontractor for further coordination. All Plumbing items shall be indicated using blue lines.
4. Fire Sprinkler Subcontractor will indicate fire sprinkler piping and equipment complete with installation and dimensioned service clearances, pipe sizes, fitting types and sizes, top or bottom of pipe elevations, distances of pipes and equipment from building reference points and hanger or support locations. Coordinate with Plumbing and HVAC Subcontractors. Minor changes and adjustments that do not affect design intent shall be made by sub-contractors and shall be highlighted for Owner and Architect's reviews. Upon completion drawings shall be forwarded to Electrical and Low Voltage Contractor for further coordination. Fire sprinkler equipment shall be indicated using red lines.
5. Electrical and Low Voltage Subcontractors will indicate service and feeder conduit runs and other electrical equipment complete, including low voltage with installation and dimensioned service clearances, sizes, top or bottom of conduit and rack elevations, distances of conduits and equipment from building reference points and hanger and support locations. Coordinate with Fire Sprinkler, Plumbing and HVAC Subcontractors. Minor changes and adjustments that do not affect design intent shall be made by sub-contractors and shall be highlighted for Owner and Architect's reviews. Upon completion drawings shall be forwarded to Contractor for further coordination. Electrical work shall be indicated in dark green lines. Low voltage work shall be indicated in light green lines.
6. Contractor will be responsible for the overall coordination review. As each coordination drawing is completed, Contractor will meet with Owner to review and resolve all conflicts on coordination drawings.
7. Coordination meetings will be held in Project field office of Contractor. Contractor is required to distribute Shop Drawings, cut sheets and submittals to Subcontractors where appropriate. Reviewed coordination drawings will be maintained in Project field office of Contractor. Meeting minutes shall be developed by Contractor and submitted to Owner within 5 days.

8. GC will provide coordination effort for Owner provided consultants (included, but not limited to, Material Testing, Roofing Commissioning, Testing and Balancing) to ensure that activities meet contractual and schedule requirements.

End of Section 01 31 13

FORT BEND INDEPENDENT SCHOOL DISTRICT
SUB-CONTRACTOR/SUB-CONSULTANT (INCLUDING SMALL BUSINESS ENTERPRISES) UTILIZATION REPORT

1. Project Name	2. Project Number	3. Application Number	4. Application Date	5. Reporting Period From: To:	6. SBE Goal	7. Scheduled Completion

This report is required by Fort Bend ISD – Failure to comply may result in FBISD commencing proceedings to impose sanctions on the Contractor/Consultant. In addition to pursing other legal remedies, sanctions may include the withholding of payments for work committed to Small Business Enterprises (SBE) participants and a negative recommendation on future bids by the Contractor/Consultant for Fort Bend ISD.

☐ **Note: SBE reporting for this pay period not applicable.**

8. Prime Contractor/Consultant's Name				9.Phone ( )	10.Fax ( )
11.Contractor/Consultant's Street Address / Suite # City State Zip			12. Project Manager (Prime)	13. PM's Phone # ( )	14. PM.'s Fax ( )
15.Current Contract Amount	16.Total Draw This Month	17. % SBE Billed to Date	18. Total Draw on Project to Date	19. % Complete to Date	

20. Federal ID Number	21. Sub-contractor / Sub-consultant	22. SBE Status	23. Work Description	24. Amount for Project	25. Amount of Current Draw	26. Total Billed to Date	27. Actual Start Date	28. Scheduled Completion Date

Commencing contract award, partial release of lien is expected from each Sub-contractor / Sub-consultant and shall accompany any application and certification for payment. Prompt payment to CONTRACTOR/CONSULTANT is dependent on appropriate documentation. The signature below of corporate officer attests to the accuracy of the information.

Company Seal

_____ _____
Signature of Company Officer Date

_____ _____
Title Telephone Number

STATE OF TEXAS, _____COUNTY
IN WITNESS WHEREOF, I have hereunto set my hand and official seal this _____ day of _____, 20__.

Notary Public, State of Texas

My Commission Expires_____

FBISD
INSPIRE•EQUIP•IMAGINE

PROJECT NAME	CONTRACTOR'S NAME

20. Federal ID Number	21. Sub-contractor / Sub-consultant	22. SBE Status	23. Work Description	24. Amount for Project	25. Amount of Current Draw	26. Total Billed to Date	27. Actual Start Date	28. Scheduled Completion Date
	Total Small Business Sub-contractor(s)/Sub-consultant(s)			$	$	$		
	Total Non-Small Business Sub-contractor(s)/Sub-consultant(s)			$	$	$		
	Total Sub-contractor(s)/Sub-consultant(s)			$	$	$		

FBISD
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INSTRUCTIONS

1. Name of Project
2. Project Number – (If applicable)
3. Application Number – from AIA document G702
4. Application Date is same date as on draw application
5. Reporting Period – from AIA document G702 "From: To:"
6. SBE Goal as set by the prime contractor for this project as applicable
7. Scheduled Completion date for your project per the approved contract or approved change order

8. – 10. Business name of prime contractor – phone & fax

11. Prime contractor mailing address

12.-14. Project Manager's name - phone & fax

15. Amount of contract including original contract amount, change orders and approved alternatives
16. The total of this draw or invoice as authorized on the AIA document G702
17. Percentage of project completed to this date by SBE Sub-contractor/Sub-consultant (Total SBE from Box 26 divided by Box 15)
18. The total amount invoiced on this project to date
19. Total percentage of project completed to date
20. Federal Identification Number
21. Business name of Sub-contractor / Sub-consultant
22. Sub-contractor's / sub-consultant's SBE Certification Designation as applicable (SBE=Small Business Enterprise; N=Non-Small Business Enterprise)
23. Brief description of work each sub will perform. (Roofing, HVAC, trash removal, consulting, etc)
24. List project value total contracted with each sub-contractor / sub-consultant
25. This month's draw amount for each sub-contractor/ sub-consultant
26. To date total billed to each sub-contractor / sub-consultant. The total amount summation must equal the % value listed in box number 17
27. Start date for each sub-contractor / sub-consultant contract
28. Scheduled completion date for each sub-contractor / sub-consultant contract

NOTE:

1. **This form must be submitted with every pay application**
2. **You must submit the partial release of liens with the pay application**
3. **You must have a copy of the SBE certification for <u>every</u> certified SBE sub-contractor/ sub-consultant on the job**
4. **If no SBE for reporting period is required, check the box indicating: "Note: SBE reporting for this pay period not applicable"**
5. **<u>This form must be notarized for each pay application or invoice submitted. The pay application can not be processed without this required certification</u>**

FBISD
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FORT BEND INDEPENDENT SCHOOL DISTRICT

SUB-CONTRACTORS/SUB-CONSULTANTS/SUPPLIERS PAYMENT CERTIFICATION FORM

Instructions:
1. This form shall be completed and signed by an officer of the Sub-contractor's/Sub-consultant's company for each payment received from the Prime Contractor and shall be returned to the Prime Contractor for its submission to FBISD.
2. The Prime Contractor shall attach this completed form to each application for payment submitted to FBISD.

PROJECT NO./TITLE: _____

NAME OF SUB-CONTRACTOR: _____

ADDRESS: _____

I hereby certify that the above firm has received payment on _____ from _____
(Date) **(Prime Contractor)**

in the amount of $_____ as full payment of our Invoice No. _____ dated _____

for work performed during _____ under Contract/Project No. _____
(Enter Time Period)

Signature: _____

Name (Print or Type): _____

Title: _____

Date: _____

Telephone: _____

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Daily construction reports.
   2. Material and equipment delivery status reports.

B. Related Sections:
   1. Division 01 Section “Construction Progress Schedule”.
   2. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
   3. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format. These documents are to be uploaded into the Owners designated software (Kahua/ Kahua):
   1. PDF electronic file. Submit and upload into owner’s designated software.

B. Daily Construction Reports: GC to submit Daily Construction Reports. These reports are to inform the Owner and Owner’s Program Manager the progress of the work being performed and work being completed. The GC shall report known deviations from the Contract Documents, any defects and deficiencies observed in the work. Reports and any required supporting documents such as photographs, test reports, etc. must be submitted in Owner designated Software.

C. Material and Equipment Delivery Status Reports: Submit at weekly construction progress meetings.

D. Request For Information (RFI): Submit at time of discovery of differing conditions.

E. Special Reports: Submit at time of unusual event

PART 2 PRODUCTS

2.1 REPORTS

A. Daily Construction Reports: Prepare a daily construction report using the Owners designated software (Kahua/ Kahua) recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. Approximate count of personnel at Project site.
   3. Equipment at Project site.
   4. Material deliveries.
   5. High and low temperatures and general weather conditions, including presence of rain, adverse weather conditions, high winds, impending tropical storms, or hurricanes.

6. Accidents.
7. Meetings and significant decisions.
8. Defects and Deficiencies
9. Photographs
10. Test Reports
11. Unusual events (refer to special reports).
12. Stoppages, delays, shortages, and losses.
13. Meter readings and similar recordings.
14. Emergency procedures.
15. Orders and requests of authorities having jurisdiction.
16. Change Orders received and implemented.
17. Construction Change Directives received and implemented.
18. Services connected and disconnected.
19. Equipment or system tests and startups.
20. Partial completions and occupancies.
21. Substantial Completions authorized.

B. Material and Equipment Delivery Status Reports: Weekly prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

PART 3 EXECUTION – Not Used

End of Section 01 32 00

PART 1 GENERAL

1.1 Description

A. Section includes administrative and procedural requirements for developing, submitting and updating a Critical Path Method (CPM) schedule.

1.2 Quality Control and Quality Assurance

A. The Contractor shall develop and maintain a Project Schedule for each project site (School) in accordance with the requirements of this Section. The requirement for a Project Schedule is included to:
   1. Ensure adequate planning before and during the execution and progress of the Work in accordance with the allowable number of working days and milestones.
   2. Assure coordination and execution of the work among various trades of the Contractor, subcontractors, suppliers, third party utility companies or other related entities that may be involved in the Project.
   3. Assist the Contractor, architect and the Owner in evaluating:
      a. Contract performance relative to the required contract schedule milestones.
      b. Monthly progress.
      c. Proposed Contract Modifications.
      d. Documenting anticipated, requested and or approved time extensions.
      e. The documentation of unplanned events, time extensions and other impacts arising from such events.

B. The project schedule shall show the sequence and interdependencies of activities required for complete performance of the work. The Contractor shall be responsible for assuring all work sequences are logical and show a coordinated plan of the work. The project schedule shall employ computerized CPM planning, scheduling and progress reporting of the work as described in this specification. The Contractor shall create and maintain the schedule using project scheduling software that utilizes the fundamentals of CPM for scheduling. New schools or projects with a value of $5M dollars or more will be required to use P6 scheduling. A variance can be given by owner's representative if requested in writing prior to the NTP.

C. New schools or projects of $5M or more: Within seven (7) calendar days after issuance of Notice to Proceed unless otherwise noted the Contractor shall designate in writing a schedule representative who shall be responsible for coordinating with the PM during development and maintenance of the Project Schedule. The Contractor's representative shall have the expertise to operate the CPM software and be capable of rapidly evaluating alternate scenarios to optimize management capabilities. The Contractor has the option to utilize qualified outside scheduling consultation for the assistance of developing and maintaining the Project Schedule, however, the use of an outside consultant does not relieve the Contractor of responsibilities for compliance of this specification. The Contractor's schedule

representative shall have complete authority to act for the Contractor in fulfilling the schedule requirements of the Contract.

D. All activities shall have at least one predecessor and one successor unless approved by the PM. The exceptions are no predecessor is needed for the Notice To Proceed (NTP) milestone and no successor is needed for the Project Completion milestone.
E. With the exception of the specified contract substantial completion milestone, the contractor shall not use any constraints of any type without prior approval of the Owner.
F. The Baseline Schedule project substantial completion milestone for each campus shall be assigned a "Finish on or Before" constraint. The required contract finish date shall be assigned to track project delivery related to contract requirements. The progress schedule submitted shall not have any constraints without approval from the owner.
G. Each activity's "Activity ID" and "Activity Description" or "Task Name" shall remain unchanged throughout the duration of the project, subsequent to the acceptance by the Owner.
H. An activity's "Activity Description" may only be revised to clarify an activity's original scope. If the scope of an activity increases or decreases, a replacement activity shall be created.
I. PM acceptance shall be obtained prior to making any changes or revisions to an activity's "Activity Description".

1.3 Submittals

A. All CPM Schedules (preliminary and baseline) shall be presented submitted per specification 01 33 00 at review meeting.. One electronic copy in pdf and an accessible format not pdf to be uploaded to Kahua per submittal procedures 01 33 00. The substantial completion date in the detailed CPM schedule shall coincide with the substantial completion date on the contract.
B. Schedule Update: The Contractor shall submit with every payment application a copy of the approved baseline CPM Schedule with a narrative of the progress or delay of scheduled activities.
C. Recovery or Revision to the CPM Schedule: The Contractor shall provide a Recovery CPM Schedule within seven (7) calendar days of any CPM schedule update meeting or at the request of the architect or owner's representative. A recovery schedule to the baseline will be requested if any milestone, completion date or end of Period Performance falls seven (7) calendar days or greater behind scheduled completion of the activity on the CPM schedule(negative float).

PART 2 PRELIMINARY CPM SCHEDULE

2.1 Preliminary CPM Schedule

A. The preliminary CPM schedule will be delivered to the owner's representative and architect within three (3) days of NTP. The preliminary CPM Schedule shall be the basis for the sequence of work during the first sixty (60) calendar days of the Contract while the Project Schedule is being developed, submitted, reviewed and accepted. If the acceptance of the Project baseline CPM Schedule

extends beyond sixty (60) days, the Preliminary CPM Schedule shall be updated according to the requirements stated in paragraph 3.3.

2.2 Schedule Review and Acceptance

A. The PM, Architect/Engineer and the Contractor shall meet within seven (7) calendar days of receipt of any CPM Schedule for joint review. The Contractor shall revise any areas, which, in the opinion of the owner's representative and/or Architect/Engineer, conflict with either the intent of this specification or the timely completion and acceptable coordination of the Project. In the event the Contractor fails to define any element of work activity or logic currently designed and the owner's representative review does not detect this omission or error, such omission or error, when discovered by the Contractor, architect or the owner's representative, shall be corrected by the Contractor.

B. Within seven (7) calendar days after the joint review between the architect, contractor and the owner's representative, the Contractor shall revise the CPM Schedule in accordance with agreements reached during the joint review and submit the revised schedule as project CPM schedule per the deliverable requirements.

C. Acceptance of the CPM project schedule by the architect and owner's representative does not relieve the contractor of any of its responsibility for the accuracy or feasibility of the project schedule. However, to the extent that the accepted Project Schedule is reasonable, it becomes a part of this Contract.

D. Submission and final acceptance by architect and owner's representative of the CPM schedule will be a condition precedent to the application or payment of any progress payments under the contract, unless otherwise agreed upon by the Owner. The owner's representative shall notify the contractor of the Owner's acceptance of the CPM Schedule in writing.

PART 3 PROJECT CPM SCHEDULE

3.1 Project Schedule

A. The Project Schedule shall begin at the project NTP and incorporate the accepted Preliminary CPM Schedule including all required revisions and applicable progress updating as warranted. The baseline project schedule shall indicate a logical sequence of work for each project site (school). Utilize the schedule in planning, scheduling, coordinating and performing the work under this Contract (including all activities of subcontractors, equipment vendors and suppliers). The Project Schedule shall indicate the sequence and interdependencies of activities required for complete performance of the Work.

Proposed durations assigned to each activity shall not exceed ten (10) days unless approved by owner's representative in writing. In developing the baseline project schedule, the Contractor shall be responsible for ensuring that subcontractor work scope and sequencing at all tiers, as well as its own work, is included. If a contract for a subcontractor has not yet been awarded for a certain portion of the work, the Contractor is responsible for the development of the schedule for the

work as described under this section. After the subcontractor award of contract, the Contractor shall modify the current accepted schedule to reflect any changes or revisions for the subcontractor sequence of work and submit for approval to architect and owner's representative. Under no circumstance or event, shall a schedule modification or revision under this paragraph extend a milestone. The baseline project schedule shall comply with the various limits imposed by the scope of work and by any contractually specified intermediate milestone dates and completion dates. The degree of detail shall be to the satisfaction of the architect and the owner's representative.

B. Provide sufficient detail and clarity of form and technique so that all work can be properly controlled and progress monitored by the owner's representative and architect. The project schedule shall consist of, but not be limited to, the following criteria:
    1. Full detail of all major procurement activities including the activities and information contained within the baseline CPM Schedule. Break up all procurement activities for major components and long lead items to include submittal dates, fabrication duration, and expected delivery dates.
    2. Full detail of all major construction activities including the activities and information contained within the CPM Schedule. Add column for responsible party (i.e. owner, subcontractor trade, 3rd party, etc.) for all construction activities.
    3. Multiple Calendars shall be used for establishing Holidays and periods of non-work based on the School Operations Parameter Statement in the Project Information Section of Division 0, concrete curing activities, other weather or ambient temperature sensitive construction activities, and or other work requiring overtime or double shift work.
    4. Seasonal weather conditions shall be considered and included in the planning and scheduling of all work influenced by high or low ambient temperatures, precipitation and/or saturated soil to ensure recognition, planning and anticipation of intermittent inclement weather throughout the project duration on a monthly basis. In addition, activities of similar nature shall be assigned to independent calendars based on this weather data. Contractor to provide a Weather Log each month as part of their Schedule Submittal.
    5. Activity duration in whole working days with a maximum duration of ten (10) working days each, unless otherwise approved by the owner's representative, except for non-construction activities including mobilization, procurement and concrete curing activities.
    6. For projects where hazardous materials are present and require abatement by the Owner, such abatement activities may take place prior to the Contractor's mobilization and start of any work or they may take place concurrently with the Contractor's work. In cases where abatement activities must take place concurrently with Contractor's work, the Contractor shall

allow for these activities to be incorporated into the Project CPM Schedule as separate activity line items. The Contractor shall allow time for these activities to take place at the appropriate time within the project schedule and shall coordinate their work with such abatement activities.

7. At a minimum, the following guidelines, intermediate and final milestones shall be included in the project schedules for each individual project site (school).
   a. Notice to Proceed
   b. Required Periodic Inspections (examples: rebar, utilities, electrical and mechanical rough-in, overhead and architectural
   c. Time allotted for coordination with and execution of abatement activities
   d. Specific Phase start and finish dates – renovations and additions
   e. CPM Schedule submission and acceptance
   f. Building dry-in
   g. Permanent power
   h. Conditioned air available
   i. Completed testing and acceptance of Life Safety Systems and other critical building components
   j. Completion of ADA upgrades in restrooms
   k. Commissioning, when project requires
   l. Building Flush out, when project requires
   m. Ten percent (10%) minimum float for the project
   n. Substantial Completion
   o. Final Completion
   p. Owner Turn-Over / Start-Up / Project Closeout Activity / Warranty Period / Owner Testing/Training
   q. Earliest Date that Owner can occupy the affected portion of the building (by phase, by complete project, etc.). This shall include all necessary approvals, permits (Fire Marshall Acceptance, Certificate of Occupancy, etc.).

C. The Contractor shall prepare a written narrative explaining the Contractor's approach to construction for the entire project. The narrative shall elaborate on the basis for durations, major equipment to be used, calendars utilized, activity coding applied, smart ID descriptions and all major assumptions used to develop and support the schedule. The narrative shall also include the Contractor's description of the critical path work activity as represented in the baselined project schedule.

D. Deliverable: Within fourteen (14) calendar days after the Notice to Proceed, the project CPM schedule deliverable will be submitted by the Contractor and uploaded to Kahua shall include the following:
   1. Two (2) copies (preferably 11 x 17) of the project schedule delivered at the review meeting. The critical path shall be readily discernible in red ink.
   2. Two (2) copies of the written narrative as described in paragraph 3.1.C.

3. One (1) electronic copy in pdf and an accessible format, not pdf, to be uploaded to Kahua per 01 33 00.

3.2 Schedule Review and Acceptance

A. The architect, owner's representative, and the Contractor shall meet within seven (7) calendar days of submitted CPM project schedule on a date selected by the owner's representative and agreed upon by all. The meeting will be to discuss review the submitted project schedule. If a revision or justification is requested, the Contractor shall re-submit the proposed project schedule within seven (7) calendar days and address all issues to the satisfaction of the architect or owner's representative. Any and all disagreements or interpretations of the meaning or intent of this specification shall be solely dictated by the Owner.

B. The architect, owner's representative and the Contractor shall meet within seven (7) calendar days of receipt of the Contractor's response, if needed, to review, corrections or adjustments of the Contractor's proposed project schedule. Any area, in the opinion of the architect and/or owner's representative, conflicts with timely completion of the project, shall be subject to revision by the Contractor.

C. Within seven (7) calendar days after the joint review meeting and no acceptance of the project schedule, the Contractor shall incorporate revisions as directed by the architect and owner's representative and re-submit the proposed project schedule per the deliverable requirement as stated in paragraph 3.1.D. All further review by the architect and owner's representative and shall be within seven (7) calendar days of receipt of revised schedule by the contractor. This will continue until the architect and owner's representative are satisfied.

D. The owner's representative shall notify the Contractor in writing of final acceptance of the Contractor's Project Schedule using submittal approval procedures stated in section 01 33 00 and the project schedule will become baseline for the project. The baseline schedule will not be changed through the life of the project unless requested by owner or owner's representative in writing.

E. In the event the Contractor fails to define any element of work, activity or logic in the project schedule during the review and the owner or owner's representative does not detect this omission or error, when discovered it shall be corrected by the Contractor and amended to the project schedule as soon as possible. The process of approving Contractor's schedules and updates to Contractor's schedule shall not constitute a warranty by the Owner that any non-Contractor milestones or activities will occur as set out on Contractor's schedule.

3.3 Schedule Updates

A. After the Project Schedule is accepted by the architect and owner's representative and the Contractor, it shall be "baselined" and used as a comparison for future progress updates.

B. If the Contractor's schedule reflects or the architect and/or owner's representative determines, that the Contractor is at least ten percent (10%) or at least negative seven (-7) calendar days behind the "baselined" schedule, the Contractor shall provide a revised or recovery schedule. The Contractor's revised or recovery schedule must

incorporate a proposed plan for bringing the work back on schedule and completing the work by the contract completion date at no additional expense to the Owner. A narrative indicating the revised approach to schedule recovery is to accompany the recovery schedule submittal. The revised or recovery schedule shall be in accordance to paragraph 1.3.B.

C. Out-of-Sequence progress logic shall be reviewed by the contractor's scheduler and corrected before submitting the progress update.

D. The percentage of all work shall be calculated by estimating the actual remaining duration time for each progressed activity. The data date of each schedule update shall be determined by the owner's representative. Contractor prepared estimates of the percent completion of each scheduled activity and the necessary supporting data shall be submitted.
    1. One (1) original baseline schedule indicating actual activity start and/or finish dates and revised (current) remaining durations.
    2. A narrative report shall be included that indicates in writing those activities the Contractor knows to be seven (7) days beyond the baseline schedule completion date and current or anticipated conditions that have delayed or may delay the work in order to discuss remedial action. The Contractor shall also explain, for work that reflects less than satisfactory progress, whether any uncompleted and/or upcoming work will (or will not) be affected in a like manner and the Contractors method of correction. Any additional written information necessary to support the updated schedule including explanations of revisions to activities: logic, durations, resources, etc.

E. In case of disagreements at the project progress meeting concerning actual progress to date, the Owner or owner's representative determination shall govern. Upon completion of the schedule update meeting, the Contractor shall revise the schedule update to reflect progress as of the date of the schedule update meeting and any approved revisions to the schedule update and carry out a computer produced calculation to determine the status of the project schedule.

F. Each Schedule Update shall be forwarded to the architect and owner's representative using the owner's project management software per section 1.3.A of this specification within seven (7) calendar days after the schedule update meeting and shall include a narrative report with the following information:
    1. Activities that have been added to the project schedule update.
    2. Activities that have been deleted from project schedule update.
    3. Activities that have "Actual Starts" prior to the month of this project schedule update and remain unfinished.
    4. Activities that have "Actual Starts and Actual Finishes" in the month of this project schedule update.
    5. A description of any approved revisions to the activity descriptions, schedule logic, or initial activity durations.

6. One (1) electronic copy of the updated CPM schedule update indicating the progress made up to the date of the schedule update and indication of any revisions to the CPM schedule update uploaded to Kahua per 1.3.A of this specifications.
7. One (1) electronic pdf format written narrative as described in paragraph 3.3.F and uploaded to Kahua with the updated schedule.
8. One (1) native "xer" electronic file with the native updated schedule for the owner's review. Transmittal by Email to the PM with a transmittal cover sheet uploaded to Kahua with the schedule pay application files.
9. A list of all days occurring for the life of the project that may have impacted the schedule. Determination on the validity of the impact will be established at the recovery schedule meeting. If all parties cannot agree the owner's representative's determination shall govern.

3.4 Revisions to the Project Schedule

A. The Contractor may also request revisions to the project schedule in the event the contractor's planning for the work is revised. If the Contractor desires to make changes in the project schedule to reflect revisions in his method of operating and scheduling of the work, the contractor shall notify the architect and owner's representative in writing, stating the reason for the proposed revision. If revision to the schedule is contemplated, the architect or owner's representative shall so advise the other in writing at least seven (7) calendar days. A schedule update meeting will be requested by the contractor describing the revision and setting forth the reasons thereof.

3.5 Project Float Time

A. Float time is not for the exclusive use or benefit of either the contractor or the Owner. Contractor's work shall proceed according to early start dates, and the Owner shall have the right to reserve and apportion float time according to the needs of the project. The contractor acknowledges and agrees that actual delays, affecting paths of activities containing float time, will not have any affect upon contract completion times, providing that the actual delay does not exceed the float time associated with those activities.

3.6 Impact Analysis for Change Orders, Delays, and Contractor Requests:

A. When changes are initiated or the Contractor desires to revise the project schedule, the contractor shall submit to the architect and owner's representative a narrative explaining the time impact to the project. The narrative will be sent to the architect and owner's representative via transmittal from Kahua and a schedule review meeting will be scheduled within seven (7) days or at the convenience of the architect and owner's representative.
B. Activity delays shall not automatically mean that an extension of time of any milestones is warranted or due to the contractor. A change or delay may not affect existing critical activities or cause non-critical activities to become critical. A change or delay may result in only absorbing a part of

the available total float that may exist within an activity chain of the network, thereby not causing any effect on any milestone.

C. A comprehensive narrative of each time impact shall be submitted within seven (7) calendar days after the commencement of a delay or the notice for a change is given to the contractor.

D. Recommendation to the Owner for the acceptance or rejection of each time impact will be made by the architect and/or the owner's representative. Recommendations shall be made within seven (7) calendar days after a schedule review meeting has taken place, unless subsequent meetings or negotiations are necessary. After a decision has been made by the Owner an acceptance notification will be sent by the owner via change order with approved time if accepted. All approved changes shall be incorporated into the baselined schedule prior to the next pay application by the contractor.

End of Section 01 32 16

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Preconstruction photographs.
   2. Periodic construction photographs.
   3. Final completion construction photographs.
   4. Periodic construction video recordings.
   5. Owner designated software

B. Related Sections:
   1. Division 01 Section "Unit Prices" for procedures for unit prices for extra photographs.
   2. Division 01 Section "Submittal Procedures" for submitting photographic documentation.
   3. Division 01 Section "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
   4. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
   5. Division 02 Section “Structure Demolition” for photographic documentation before building demolition operations commences.
   6. Division 02 Section "Selective Structure Demolition" for photographic documentation before selective demolition operations commence.
   7. Division 31 Section "Site Clearing" for photographic documentation before site clearing operations commence.

1.3 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph or video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files in the quantities and at the intervals described in paragraph 3.1 of this section.
   1. Digital Camera: Minimum sensor resolution of 10 mega pixels.
   2. Format: Unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
   3. Identification: Provide the following information with each image description in file metadata tag:
      a. Name of Project.
      b. Name of Contractor.
      c. Date photograph was taken.

d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
e. Unique sequential identifier keyed to accompanying key plan.

C. Construction Photographs: The project requires comprehensive documentation of construction progress and post inspection milestones. Submit electronic copies of each photographic view in the quantities and at the intervals described in paragraph 3.1 of this Section.
1. "Progression" photo sets are to be performed at periodic intervals throughout the duration of construction, as applicable to the scope and as follows:
a. Site survey (Pre-construction): A one-time shot that provides coverage of site and immediate surroundings.
b. Interior progression shots: Broadly track the improvements from logical perspectives, to be performed at regular intervals and coordinated with pace of erection.
c. Pre-slab/Pre-Chase/Interior record shots: Underground or concealed utilities will be documented post inspection/pre-insulation and prior to pouring slabs, backfilling or closing chases/walls/ceilings.

D. Video Recordings: Submit video recordings in accordance with paragraph 3.2 of this Section.
1. Submit video recordings in digital electronic format.
2. Identification: With each submittal, provide the following information:
a. Name of Project.
b. Name of Contractor.
c. Date recording was recorded.
d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
e. Weather conditions at time of recording.

1.4 QUALITY ASSURANCE
A. Photographer Qualifications: An individual who has the basic skills necessary to record digital photographs and electronic recordings.

1.5 COORDINATION
A. Auxiliary Services: Provide auxiliary services necessary, including temporary lighting required to produce clear, well-lit photographs.

1.6 USAGE RIGHTS
A. Contractor will transfer copyright usage rights if necessary to Owner for unlimited reproduction of photographic documentation.

PART 2 PRODUCTS

2.1 PHOTOGRAPHIC MEDIA
A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 10 mega pixels.
B. Digital Video Recordings: Provide high-resolution, digital video recordings.

PART 3 EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
   1. Taking photographs or video recordings with students and schools staff included on the photograph is strictly prohibited.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
   1. Date and Time: Include date in file name for each image.

C. Preconstruction Photographs: Before starting demolition or construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, or as directed by Architect.

D. Periodic Construction Photographs: Take photographs and submit with daily field report in Kahua. Select vantage points to show status of construction and progress since last photographs were taken.

E. Final Completion Construction Photographs: Take a minimum of 20 color photographs after date of Substantial Completion for submission as project record documents.

3.2 CONSTRUCTION VIDEO RECORDINGS

A. Owner's Training: Record video during the manufacturer's training session. Deliver the recordings with the O&M Manual(s).

B. Submit videos in electronic format on flash drives. Label all videos according to the equipment the training is about.

End of Section 01 32 33

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections but not limited to:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment.
2. Division 01 Section "Schedule of Values" for submitting the schedule of values.
3. Division 01 Section "Project Management and Coordination" key personnel.
4. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
5. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
6. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
7. Division 01 Section "Demonstration and Training" for submitting video recordings of equipment demonstration and training of Owner's personnel.

C. Refer to other Division 1 Sections and other Contract Documents for Specifications on administrative submittals. Such submittals include, but are not limited to the following:

1. Permits.
2. Payment Applications.
3. Inspection and Test Reports.
4. Schedule of Values
5. Progress Reports.
6. Listing of Subcontractors

D. Shop Drawings are technical drawings and data that have been specially prepared for this Project, including but not limited to the following items:

1. Fabrication and installation drawings.
2. Setting diagrams.
3. Shop-work manufacturing instructions.
4. Templates.

5. Patterns.
6. Coordination drawings (for use on-site).
7. Schedules.
8. Design mix formulas.
9. Contractor's engineering calculations.

Standard information prepared with specific reference to a Project is not considered to be shop drawings.

E. Product Data includes standard printed information on manufactured products that has not been specially prepared for this Project, including but not limited to the following items:
   1. Manufacturer's product specifications and installation instructions.
   2. Standard color charts.
   3. Catalog cuts.
   4. Rough-in diagram and templates.
   5. Standard wiring diagrams.
   6. Printed performance curves.
   7. Operational range diagrams.
   8. Mill reports.
   9. LEED specific information (as applicable)
   10. Standard product operating and maintenance manuals.

   Modify standard product data, drawings and diagrams to delete information not applicable to the project, and / or supplement standard information to provide specific data that is applicable to the work.

F. Samples are physical examples of Work, including but not limited to the following items:
   1. Partial sections of manufactured or fabricated work.
   2. Small cuts or container of materials.
   3. Complete units of repetitively used materials.
   4. Swatches showing color, texture and pattern.
   5. Color range sets.
   6. Units of work to be used for independent inspection and testing.

G. Miscellaneous Submittals are work-related, non-administrative submittals that do not fit in the three previous categories, including but not limited to the following:
   1. Specially prepared and standard printed warranties.
   2. Maintenance agreements.
   3. Workmanship bonds.
   4. Survey data and reports.
   5. Project photographs.
   6. Testing and certification reports.
   7. Record Drawings.
   8. Field measurement data.
   9. Operating and maintenance manuals.
   10. Keys and other security protection devices.
   11. Maintenance tools and spare parts.
   12. Overrun stock.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's and/or Contractor’s responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.

B. Informational Submittals: Written and graphic information and physical samples that may or may not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals.

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections. Submittal schedule will be delivered by contractor within 7 days of NTP.

1. Coordinate submittal schedule with list of subcontracts and Contractor's construction schedule.
2. Submit revised submittal schedule monthly to reflect changes in current status and timing for submittals.
3. Format: Arrange the following information in a tabular format:
   a. Scheduled date for first submittal.
   b. Specification Section number and title.
   c. Submittal category: i.e. Action, informational, shop drawing.
   d. Name of subcontractor.

e. Description of the Work covered.
f. Scheduled date for Architect's final release or approval.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Contractor must process Submittals using the Owners designated software (Kahua).

B. Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
   1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings. Architect will use transmittal in owner's designated software to record distribution of CAD drawings or other electronic files.
      a. Digital Drawing Software Program: The Contract Drawings may be in AUTOCAD format.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
      b. Coordination/ approval of certain submittals may be required by either owner or owner designated consultants.

D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 14 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow 14 calendars days for review of each resubmittal.

4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 14 calendar days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

E. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.
   1. Indicate name of firm or entity that prepared each submittal on label or title block.
   2. Include the following information for processing and recording action taken:
      a. Project name
      b. Date
      c. Name of Architect
      d. Name of Contractor
      e. Name of subcontractor
      f. Name of supplier
      g. Name of manufacturer
      h. Submittal number or other unique identifier, including revision identifier.
         1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
      i. Number and title of appropriate Specification Section.
      j. Drawing number and detail references, as appropriate.
      k. Location(s) where product is to be installed, as appropriate.
      l. Other necessary identification.

F. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:
   1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
   2. Name file with submittal number or other unique identifier, including revision identifier.
      a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
   3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
   4. Include the following information on an inserted cover sheet as applicable:
      a. Project name.
      b. Date.
      c. Name and address of Architect.

d. Name of Contractor.
e. Name of subcontractor.
f. Name of supplier.
g. Name of manufacturer.
h. Number and title of appropriate Specification Section.
i. Drawing number and detail references, as appropriate.
j. Location(s) where product is to be installed, as appropriate.
k. Related physical samples submitted directly.
l. Other necessary identification.

5. Include the following information as keywords in the electronic file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

G. Options: Identify options requiring selection by the Architect.
H. Deviations: Identify deviations from the Contract Documents on submittals.
I. Transmittal: Assemble each submittal individually and upload to owner's designated software. Use submittal procedures to direct submittals to the party or parties responsible for review and approval of submittal. Reviewers will return submittals using the owner's designated software submittal reviewer procedure.
J. Resubmittals: Make resubmittals in same form as initial submittal and use owner's designated software submittal procedure.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision.
   3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, and installers, authorities having jurisdiction, and others as necessary for performance of construction activities.
L. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Post electronic submittals as PDF electronic files directly to the appropriate location within the Owners designated software
      a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
   2. Submit electronic submittals via the Owners designated software as PDF electronic files.

a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

3. Action Submittals: Submit informational submittal with request for Architect to review action submittal and provide date and time for event.
   a. Create individual action submittal using owner's designated software. Provide cover page per section F.4. Provide pictures, copies of emails or other proof Architect and contractor have reviewed action submittal.
4. Informational Submittals: submit as PDF electronic files directly to the appropriate location within the Owners designated software.
5. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
6. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
7. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's catalog cuts.
      b. Manufacturer's product specifications.
      c. Standard color charts.
      d. Statement of compliance with specified referenced standards.
      e. Testing by recognized testing agency.
      f. Application of testing agency labels and seals.
      g. Notation of coordination requirements.
      h. Availability and delivery time information.
   4. For equipment, include the following in addition to the above, as applicable:
      a. Wiring diagrams showing factory-installed wiring.
      b. Printed performance curves.
      c. Operational range diagrams.
      d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
   5. Submit Product Data before or concurrent with Samples.
   6. Submit Product Data in the following format:
      a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based upon Architect's digital data drawing files is otherwise permitted.
    1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
        a. Identification of products.
        b. Schedules.
        c. Compliance with specified standards.
        d. Notation of coordination requirements.
        e. Notation of dimensions established by field measurement.
        f. Relationship and attachment to adjoining construction clearly indicated.
        g. Seal and signature of professional engineer if specified.
    2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
    3. Submit Shop Drawings in the following format:
        h. PDF electronic file.
        i. Primitive native file if requested by architect or owner.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
    1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
    2. Identification: Attach label on unexposed side of Samples that includes the following:
        a. Generic description of Sample.
        b. Product name and name of manufacturer.
        c. Sample source.
        d. Number and title of applicable Specification Section.
    3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
        a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
    4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
        a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line.

Architect will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Architect to approve sample size.
    a. Number of Samples: Submit three sets of Samples. Architect will retain one with option to provide owner a sample; Sample sets; remainder will be returned.
        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
    1. Name, address, and telephone number of entity performing subcontract or supplying products.
    2. Number and title of related Specification Section(s) covered by subcontract.
    3. Drawing number and detail references, as appropriate, covered by subcontract.
    4. Submit subcontract list in the following format:
        a. PDF electronic file.
        b. Number of Copies: Three paper copies of subcontractor list, unless otherwise indicated. Architect will return two copies.

F. Qualification Data: Prepare written in pdf format information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, and other information specified.

G. Welding Certificates: Prepare written in pdf format certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

H. Installer Certificates: Submit written in pdf format statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
I. Manufacturer Certificates: Submit written in pdf format statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
J. Product Certificates: Submit written in pdf format statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
K. Material Certificates: Submit written in pdf format statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
L. Material Test Reports: Submit reports in pdf format written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
M. Product Test Reports: Submit written reports in pdf format indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
N. Research Reports: Submit written in pdf format evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
    1. Name of evaluation organization.
    2. Date of evaluation.
    3. Time period when report is in effect.
    4. Product and manufacturers' names.
    5. Description of product.
    6. Test procedures and results.
    7. Limitations of use.
O. Preconstruction Test Reports: Submit reports written in pdf format by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
P. Compatibility Test Reports: Submit reports written in pdf format by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
Q. Field Test Reports: Submit reports in pdf format indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with

requirements in the Contract Documents. Submit reports in owner's designated software

R. As pdf file upload in owner's designated software with daily report for the work by contractor.

S. Design Data: Prepare and submit written in pdf format and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect using owner's designated software in RFI module.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit in pdf format a copy of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT/ENGINEER'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
    1. Action Stamp: The Architect/Engineer will stamp each submittal to be returned with a uniform, self-explanatory stamp, appropriately marked and executed to indicate the status of the submittal.
C. Informational Submittals: Architect will review each submittal. Architect will upload each submittal to owner's designated software in the RFI module following the reviewer procedure.
D. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review. Architect will notify contractor through owner's designated software via the RFI module or via email the submittal is incomplete.
E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.
F. Submittals that are required per contract agreements may be reviewed and approved by owner or owner's representative.

End of Section 01 31 00

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, FBISD Safety Program Guidelines Manual, apply to this Section.

1.2 CONSTRUCTION SAFETY AND LOSS CONTROL PROGRAM

A. Contractor, along with the Subcontractors of all tiers, shall develop a composite Safety Program. The safety plan establishes minimum standards of performance regarding safety during the course of the work on the project. The prevention of job-related injuries and illnesses may require additional safety devices and/or procedures beyond these minimum standards. This Safety Program will include enforcement of safe practices, instructions, and direction in the use of safety equipment and personal protective equipment, and other such activities as may be necessary and appropriate to maintain job safety and accident prevention. A copy of the site-specific plan shall be submitted to the FBISD Project Manager for review prior to starting work onsite following submittal procedures outlined in 01 33 00.

B. Implementation and enforcement of the Safety and Loss Prevention Program for the work force of Contractor and all Subcontractors shall be responsibility of Contractor. Owner or representatives of the owner may conduct periodic jobsite safety inspections to monitor compliance with the Safety and Loss Prevention Program. If Contractor activities are not in compliance with their Safety and Loss Prevention Program, Owner or owner's representative will inform the Contractor in writing of the observed noncompliance, or safety hazards using owner's designated software. These items must be corrected in a timely manner. If the Contractor fails to correct any safety non-compliance or hazard, the Owner shall have the right but not the obligation to perform the correction action and withhold costs associated with the corrective action from the Contractors next or final payment. The owner or owner's representative reserve the right to shut down the job until corrections have been initiated and documented.

C. It is not the intent of this Contract to require the Owner, to provide services, assume responsibility or accept liability for the safety of work sites or any aspect of the work by Contractors or Subcontractors. Each contractor shall bear sole and exclusive responsibility for safety in all phases of their work. Nothing contained herein shall relieve such responsibility.

D. The Owner's role in achieving construction safety and health objectives include overall supervisory management for site safety. This responsibility does not supersede, override or take precedence over that of construction Contractors, who are ultimately responsible for the safety and health of their employees, Subcontractors, visitors, students, staff, the public and protection of property. The primary functions of the Owner as it relates to construction safety and health are to monitor Contractor compliance with the safety and health standards required by law and to

administer and enforce the conditions of the contract pertaining to safety, health, and security.

E. Each Contractor and Subcontractor shall comply with all applicable safety related laws, including the following:
    1. Walsh-Healy Public Contracts Act 9 (Title 41 CFR, Part 50-2-3) and the included rules and regulations contained in the Occupational Safety and Health Standards, and Established Federal Standards (Title 20 CFR, Part 1910 and CFR, Part 1926).
    2. U.S. Department of Transportation Safety Requirements – Federal Highway Projects, 1968, including the requirements referred to in Appendix A therein.
    3. State and local codes and regulations.
F. Safety Documentation Reporting: Contractor shall submit to Owner and owner's representative the following reports upon request:
    1. All accident investigation reports shall be submitted no more than 24 hours after occurrence. The Contractor must maintain accurate records of personal injury and property loss, cooperate and aid in investigation of cases, and implement appropriate actions to prevent recurrence. Owner's representative shall be notified immediately following all accidents.
    2. A binder shall be maintained on site documenting safety orientation of new hire employees and shall be submitted when requested.
    3. Weekly Contractor-held safety meeting reports shall be logged in a binder on site and submitted upon request.
    4. Weekly site safety inspection reports performed by Contractor shall be logged in a binder on site weekly.
    5. Safe Plans of Action (SPA) shall be completed by the contractor prior to each task if required by loss and safety prevention plans and submitted upon request.
    6. Task Safety Awareness (TSA) meeting documents shall be maintained by the contractor if required by loss and safety prevention plans for review by the FBISD Project Manager upon request.
    7. A summary log of all accidents and injuries including first-aid treatments is to be maintained on site and submitted upon request.
    8. Crane re-certifications on an occurrence basis and proof of certification prior to beginning work shall be maintained in a log on site and submitted upon request.
    9. A Job Safety Analysis (JSA) shall be performed, signed off by all crewmembers, job superintendent; and Contractors competent person prior to all lifting activities using any means.
    10. Crane Safety – all crane operations will require a JSA for all hoisting operations; copy of the crane lift chart marked with longest and heaviest lifts; all crew members to sign off on JSA; barricade tape around crane at all times; need crane crew to

indicate on a copy of the crane's lift chart where the highest and heaviest pick is located; tail swing location, etc.

11. A summary of contractor's OSHA Safety Violations and Citations for the site will be submitted to owner or owner's representative 4 working days prior to the opening Inspection Conference.
12. A notice of work termination shall be submitted via transmittal in owner's software to owner or owner's representative by the Contractor within 10 calendar days of a Subcontractor completing work under its Contract and leaving the jobsite.
13. A site-specific safety plan must be submitted via submittal procedure 01 33 00 within thirty (30) days of NTP. The final site-specific safety plan must be accepted by Owner prior to approval of first pay application.
14. Name and qualifications of an on-site safety person will be documented within the site-specific safety plan prior to approval of plan.
15. List of Hazardous Substances brought on site and SDS for each item.
16. Copy of OSHA 300 log for their project.
17. Accident and injury reports within 24 hours of occurrence.

1.3 SITE SAFETY DEVICES

A. Contractor and its Subcontractors performing work at project site maintain responsibility for providing all safety related equipment such as, but not limited to, testing equipment, safety valving, chains, locks, alarms, signal, signage, and personal protective equipment necessary to protect site workers, students, staff, and the general public.

B. Employees on walking and/or working surfaces with unprotected sides or edges six feet (6') or higher above a lower level shall be protected from falling by the use of guardrails, nets or personal fall arrest systems. This shall include, but is not limited to employees on the face of formwork, reinforcing steel or structural steel during and after erection, exterior and interior masonry work, roofing work, window installation, electrical work, mechanical work, and all other trades that require crafts/workers to work in areas where the height exceeds six feet (6') above the ground or work surface.

C. One hundred percent (100%) personal eye wear and head wear protection is required in all construction work areas and shall be worn at all times by employees of both the contractor and subcontractors (regardless of subcontractor tier). Protective eye wear shall conform and meet requirements stated in ANSI 287.1-1968.

D. Clean-Up and Waste Disposal. Contractor shall perform a daily site cleanup and otherwise keep the Project Site free from accumulation of waste materials, rubbish and other debris resulting from the performance of the Work. The Contractor shall also be responsible for providing mowing / grass cutting services for areas inside of the construction areas weekly. Contractor shall, in compliance with Applicable Laws, remove, transport, and dispose of any Hazardous Substance transported onto the Project Site by or on behalf of Contractor or any Subcontractor's activities

at the Project Site. Contractor shall notify the Project Company immediately upon the discovery of the presence of any Hazardous Substance on, or the release of any set forth above, Contractor shall not be responsible for the transportation, handling, storage or removal of any Hazardous Substances which existed at, on or in the Project Site prior to commencement by Contractor of the Work.

1.4 RESPONSIBILITY

A. Each participant involved in the construction of the project is individually responsible for conducting their activities to ensure compliance with all applicable project safety and health requirements. The owner and owner's representative are on site as observers and will help to monitor the approved contractor's loss and safety prevention plan and enforce federal, state, and local regulations or codes. The Contractor and the Contractor's Site Safety Manager is responsible for detailed monitoring of construction activities.

1.5 CONTRACTOR SITE SAFETY MANAGER RESPONSIBILITIES

A. The Contractor's Site Safety Manager is responsible for implementing the safety and health plan at the project level. The following specific safety and health plan guide will be followed:
    1. Pre-plan work activities through the use of Safe Plans of Action (SPA) in order to identify and control and safety and health issues, which may pose a hazard to employees or others.
    2. Contractors are responsible for completing Safe Plans of Action (SPA) and communicating them to employees prior to beginning each work task. This communication of safe work practices will be documented through the Task Safety Awareness meeting and form.
    3. Establish and maintain a safe and healthy work environment by adhering to the guidelines and procedures issued in the latest document of the Federal, State, local code, and site-specific requirements.
    4. Ensure that all Contractor employees and Subcontractors implement and abide by the safety, health, and security rules and regulations set forth by all regulatory agencies as well as those established by this plan.
    5. Hold, at minimum, weekly meetings with Subcontractors to discuss accident prevention measures, review any accident prevention measures, review any accidents which might have occurred since the last meeting, and institute any additional safety measures necessary to prevent future accidents. Meetings will include incidents, which may pose potential third party claim exposures to the District.
    6. Assure that Owner's staff is knowledgeable of all Contractor Subcontractor safety and health programs. The safety manager will give special attention to those operations, which require a coordinated effort by the Contractor and Owner.
    7. Maintain open and continuing communications between the Owner and the Contractors on safety and health issues.

8. Assure that the safety program general requirements apply to visitors entering the project sites. A visitor's log will be established and maintained at each project.
9. Arrange for specific job safety training for Owner's staff members using or operating special equipment or entering confined spaces and/or the use of other personal protective equipment or other analysis instruments.
10. Require the Contractor personnel complete a thorough investigation of all accidents, occurrences. Reports shall be completed and submitted to the FBISD Project Manager within 24 hours after the occurrences.
11. Assure that safety is the FIRST subject of EVERY Contractor/Subcontractor meeting.
12. Review all safety inspection reports with the Subcontractors during the weekly progress meeting.
13. Prior to the construction activity by any Contractor and/or Subcontractor the Safety Manager will assure that all pre-work job safety analysis submittals have been reviewed.
14. Verify the Contractor has no outstanding safety deficiencies that could result in the delay of payment.
15. Assign and manage additional Contractor safety personnel as warranted.
16. Conduct weekly Contractor safety records and performance audits.
17. Attend safety training sessions as required by the Owner.

1.6 OWNER'S RESPONSIBILITIES

A. Review Contractors/Subcontractors safety plan.
B. Make recommendations for administrative action when Contractors fail to correctly identify safety, health, or environmental deficiencies.
C. Attend Contractor/Subcontractor toolbox safety meetings as deemed necessary.

1.7 CONTRACTOR SITE SAFETY SUPERINTENDENT (for projects exceeding $10 million dollars)

A. The Contractor shall appoint a Competent Site Safety Superintendent. The site safety superintendent may have other responsibilities on the project. Contactor shall submit, in writing, the name and qualifications of the proposed individual to serve as Site Safety Superintendent to FBISD for approval, prior to beginning work. The Site Safety Superintendent shall be qualified to serve in this capacity and shall not be changed without written notice to the FBISD Project Manager. All employee substitutions into this position must be approved by the FBISD Project Manager. The Owner shall have right to require removal of the Site Safety Superintendent should he/she be deemed incompetent, obstructive or ineffective in carrying out the work.
B. The Site Safety Superintendent employed by the Contractor shall have full authority to act and make decisions for the Contractor in safety and loss control related matters.
C. The Contractor's Site Safety Superintendent shall monitor all work to assure that it is being performed in accordance with the requirements of

the Safety Program and site specific Contactor Safety Program. This person shall be present at the work site during regular and other work hours acting the capacity of Site Safety Superintendent.

D. Smoking shall be prohibited on all FBISD jobsites

1.8 SAFETY

A. Conduct weekly safety sessions.

B. Attendance: Mandatory for superintendent and foreman for Contractor and each Subcontractor.

End of Section 01 35 23

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control. Testing and Inspection documentation should be generated using the Owner's designated software.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. Owner will employ and pay for the service of an Independent Testing Laboratory to perform specified testing and laboratory services.

1. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
2. Contractor shall cooperate with the Laboratory to facilitate the execution of its required services.
3. Contractor shall pay for additional samples and tests required for Contractor's convenience or when initial tests indicate work does not comply with Contract Documents.
4. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
5. Specified tests, inspections, and related actions do not limit Contractor's other quality- assurance and -control procedures that facilitate compliance with the Contract Document requirements.
6. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this section.

C. Related Sections:

1. Division 01 Section "Allowances" for testing and inspecting allowances.
2. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
3. Division 01 Section "Execution" for cutting and patching.
4. Divisions 02 through 49 Sections for specific test and inspection requirements.
5. Division 01 Section "Testing, Adjusting, and Balancing for HVAC" (TAB provided by owner)

1.3 DEFINITIONS

A. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

B. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
C. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
D. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
E. Testing Agency: An entity engaged by the Owner to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
F. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
    1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.
G. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.
C. Conflicts between the specifications and the construction documents. The most stringent requirement will govern.
D. Conflicts on specification requirements. The most stringent requirement will govern.

1.5 INFORMATIONAL SUBMITTALS

A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
B. Schedule of Tests and Inspections: Prepare in tabular form and include the following, as applicable:
    1. Specification Section number and title.

2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.6 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following as applicable:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and re-inspection.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of technical representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement whether conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of factory authorized service representative making report.

2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient p roduction capacity to produce required units.
D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329, ‘Standards of Recommended Practices for Inspection and Testing Agencies for Concrete and Steel as Used in Construction’; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
    1. NRTL: A Nationally Recognized Testing Laboratory according to 29 CFR 1910.7.
    2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's

products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and re-inspection of construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities:
   1. For tests and inspections performed by the Owner’s Testing Laboratories:
      a. Cooperate with Laboratory personnel; provide access to Work and to manufacturer’s operations.
      b. Secure and deliver to the Laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
      c. Furnish to the Laboratory proposed concrete design mixes, and other material mixes which require evaluation by the Testing Laboratory, a minimum of fourteen (14) days prior to use on the Project.
      d. Furnish incidental labor and facilities
         1) To provide access to Work to be tested.
         2) To obtain and handle samples at the Project site or at the source product to be tested.
         3) To facilitate inspections and tests.
         4) For safe storage and curing of test samples.
         5) Notify Laboratory, PM and Architect sufficiently in advance of operations to allow for Laboratory assignment of personnel and scheduling of tests.
            a) When test or inspections cannot be performed after such notice, reimburse Laboratory for personnel and travel expenses incurred due to Contractor’s negligence.
         6) Make arrangements with Laboratory and pay for additional samples, tests, or inspections as required for the Contractor’s convenience.

7) Make arrangements with Laboratory and pay for additional samples and tests required when initial test indicate non-compliance with Contract Documents, including load test.

2. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   a. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   b. Retain first subparagraph below if some Specification Sections require an independent testing agency to perform certain tests and inspections.
   c. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
   d. Retain first subparagraph below to assure validity of agencies' reports.
   e. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.
   f. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
3. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
4. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Re-inspection: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspection, for construction that replaced Work that failed to comply with the Contract Documents.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of

delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses. .

1. Distribution: Distribute schedule to Owner, PM, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 EXECUTION

2.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours. Provide a copy of the log at completion of the project upon request of Architect, owner or owner’s representative.

2.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

End of Section 01 40 00

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK REQUIREMENTS

A. General: This Section specifies procedural and administrative requirements for compliance with governing regulations and codes and standards imposed upon the Work. These requirements include the obtaining of permits, licenses, inspections, releases, and similar statements, as well as payments, associated with regulations, codes, and standards.

B. “Regulations” is defined to include laws, statutes, ordinances, and lawful orders issued by governing authorities, as well as those rules, conventions and agreements within the construction industry which effectively control the performance of the Work regardless of whether they are lawfully imposed by governing authority or not.

C. Governing Regulations: Refer to General and Supplementary Conditions for requirements related to compliance with governing regulations.

1.3 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized", "selected", "required", and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown", "noted", "scheduled", and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
J. “Testing Agencies”: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and , if required, to interpret results of those inspections or tests.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference. Individual Specification Sections indicate which codes and standards the Contractor must keep available at the project site for reference.
B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
C. Conflicting Requirements: Where compliance with two or more standards is specified, and where these standards establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents specifically indicate a less stringent requirement. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Architect/Engineer for a decision before proceeding.
D. Minimum Quantities or Quality Levels: In every instance the quantity or quality level shown or specified is intended to be the minimum for the work to be provided or performed. Unless otherwise indicated, the actual work may either comply exactly, within specified tolerances, with the minimum quantity or quality specified, or may exceed that minimum within

reasonable limits. In complying with these requirements, the indicated numeric values are either minimum or maximum values, as noted, or as appropriate for context of the requirements. Refer instances of uncertainty to the Architect/Engineer for decision before proceeding.

1.5 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the trade association, standards-producing organization, authorities having jurisdiction or other entity applicable to the context of the text provision.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the.

C. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations

1.6 SUBMITTALS

A. Permits, Licenses and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work. Submit all applicable records via transmittal using owner designated software.

End of Section 01 42 00

SECTION 01 45 23

TESTING AND INSPECTING SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Requirements and qualifications including but not limited to:
   1. Professional testing and laboratory services.
   2. Accessories necessary for the completion of testing and laboratory services.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality assurance and quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and quality control procedures that facilitate compliance with Contract Document requirements.
   3. Requirements for Contractor to provide quality assurance and quality control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions.
   4. Specific test and inspection requirements are not specified in this Section.

C. A qualified independent testing laboratory and/or geotechnical engineering service selected and paid by Owner.
   1. The Owner will pay for the initial laboratory services of materials that comply with the requirements of the Contract Documents. The Contractor shall pay for testing and retesting of materials that do not comply with the requirements of the Contract Documents.

D. Inspecting agency shall perform inspections and tests in accordance with the rules and regulations of the building code, local authorities, Specifications of ASTM, and the Contract Documents.

E. Materials and workmanship found not in compliance with required standards or performance obligations shall be removed and replaced. Replacement and subsequent testing shall be at Contractor’s expense.

F. Where terms “Inspector” and “Laboratory” are used, it is meant and in reference to an officially designated and accredited inspector of the testing laboratory or geotechnical service engaged by Owner.

G. Laboratory inspections shall not relieve the Contractor or Fabricator of his responsibility to furnish materials and workmanship in accordance with the Contract Documents.

H. Contractor or Fabricator shall cooperate with the testing laboratory in matters pertaining to the Work.

I. Contractor to address deficiency and failed reports.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, documented according to ASTM E 329 and ASTM E534; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
   3. Testing agencies shall be insured against errors and omissions by a professional liability insurance policy having a minimum limit of liability of $500,000.00.

B. Inspection and testing services the of testing agency shall be under the direction of a Registered Engineer licensed in the State of Texas, charged with engineering managerial responsibility, and having a minimum of five (5) years engineering experience in inspection and testing of construction materials.

C. Concrete Inspectors: Inspecting personnel monitoring concrete Work shall be ACI certified inspectors.

D. Structural Steel: Primary inspectors performing structural steel inspection shall be currently certified AWS Certified Welding Inspectors (CWI), in accordance with the provisions of AWS QCI, *Standard and Guide for Qualification and Certification of Welding Inspectors*.
   1. Inspector may be supported by assistant inspectors who perform specific inspection functions under the direct supervision of the Primary Inspector. Assistant inspectors shall be currently certified AWS Certified Associate Welding Inspectors (CAWI). Work of assistant inspectors shall be monitored daily by the inspector.

E. Testing Equipment: Equipment shall be calibrated at intervals not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standards.

F. Referenced Standards: Latest adopted edition of standards referenced apply to the Work. In the event of conflict between the Contract Documents and referenced standards, the Contract Documents shall govern. In case of conflict between Contract Documents and the Building Code, the more stringent shall govern.

1.4 QUALITY CONTROL

A. Owner Responsibilities: Where quality control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform the services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Refer to the individual specification sections for specific requirements.
   2. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.
   3. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform the quality control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   4. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   5. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality control service.
   6. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   7. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
   8. Associated Responsibilities and Services: Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
      a. Provide access to the Work.
      b. Deliver of samples to testing laboratory, without cost to Owner, in adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
      c. Advise laboratory and Architect sufficiently in advance of construction operations to allow laboratory to complete required inspections or tests and to assign personnel for field inspection and testing as specified.
      d. Provide facilities for storage and curing of concrete test samples on site for the first 24 hours and for subsequent field curing required by ASTM C31.
      e. Incidental labor, facilities, and equipment necessary to assist laboratory personnel in obtaining and handling samples at the site.
      f. Preliminary design mix proposed for use for material mixes that require control by testing agency.
      g. Provide concrete mix designs in accordance with ACI 301 Section 3.9 made by an independent testing laboratory or qualified concrete supplier. Where mix designs by an independent testing laboratory are required, select and pay for laboratory.
      h. Obtain required inspections or approvals of the building official. Inspection requests and notifications required by building code are responsibility of the Contractor.
      i. Provide current welder certificates for each welder employed.
      j. Provide fabrication and erection inspection and testing of welds in accordance with AWS D1.1, Chapter 6.
         1) Use prequalification of welding procedures in executing the Work.
      k. Security and protection for samples and for testing and inspecting equipment at Project site.

9. Retesting/Reinspecting: Regardless of payment responsibility of the original tests or inspections, provide quality control services, including retesting and reinspecting, for construction that replaced Work failing to comply with the Contract Documents or Code requirements.

C. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

D. Coordination: Coordinate sequence of activities to accommodate required quality assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.5 AUTHORITY AND DUTIES OF LABORATORY PERSONNEL

A. A representative of the testing laboratory, who has reviewed and is familiar with the project and specifications, shall participate in preconstruction conferences. The representative shall coordinate material testing and inspection requirements with the Contractor and its subcontractors consistent with the planned construction schedule. The laboratory representative shall attend conferences required or requested to address quality control issues.

B. Laboratory personnel shall inspect and test materials, assemblies, specimens, and Work performed, including design mixes, methods and techniques and report the progress to the Architect.

C. If material or Work fails to meet requirements of Contract Documents, laboratory inspector shall notify the Construction Manager, Architect, Engineers, supplier or subcontractor providing or preparing the materials or Work being tested of such failure.

D. Laboratory personnel shall not perform the Work of the Contractor or act as foremen or superintendents. Work will be inspected as it progresses, but failure to detect defective Work or materials shall not prevent later rejection when a defect is discovered.

E. Laboratory personnel are not authorized to revoke, alter, relax, enlarge, or release the requirements of the Contract Documents or approve or accept portions of Work, except where approval is specifically specified in the Specifications.

F. Comply with building code requirements for Special Inspections.

1.6 SUBMITTALS

A. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality control service.

C. Test and Inspection Reports: Prepare and submit certified written reports specified. Include the following:
1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.

4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Submit copies of reports of each inspection and test:
1. Owner, Program or Project Manager, Architect, and each Engineer or outside consultants regarding their particular phase of the project: One copy each.
2. Construction Manager and Contractor: Two copies each.

E. In addition to furnishing a written report, notify Construction Manager and Contractor verbally of uncorrected conditions or failures to comply with requirements of the Contract Documents, and immediately fax and email corresponding report to the Architect and Engineer.

F. At completion of each trade or branch of Work requiring inspecting and testing, submit a final certificate attesting to satisfactory completion of Work and full compliance with requirements of Contract Documents.

G. Submit copies of test results sealed by a Registered Engineer to municipal authorities having jurisdiction, as required.

1.7 TESTING LABORATORY GUIDELINES AND PROCEDURES

A. Technicians scheduled to perform specific testing services must be qualified to review and perform other services that overlap, i.e. earthwork, foundation inspections, rebar inspection, and concrete when scheduled concurrently at the site.

B. Technician time for services performed will be reimbursed at a regular time rate. Compensation at the overtime rate will be considered for hours over eight hours spent at the site on a single day, field testing services performed on a Saturday or Sunday, and field services performed on a recognized holiday.

C. There shall be a three hour minimum for each scheduled testing service. Vehicle charges will be included on a $25.00 per trip basis.

D. Cylinder pick up will be controlled by the technician performing test on a scheduled pick up day. If there are no testing services scheduled, the cylinder pick up fee is $40.00 on week days and $50.00 on weekends and holidays with no technician or vehicle charge.

E. The Contractor shall bear the responsibility of scheduling the testing services. The Contractor and the testing laboratory shall assume full responsibility to coordinate the testing services. Cancellations or failed test shall be reimbursable to the Owner by the responsible party for the cancellations or failure of a test or service.

PART 2 - PRODUCTS
Not used.

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.
5. Deficiency log.

B. Maintain log at site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 TESTING AND INSPECTION SERVICES

A. Testing services shall include, but not be limited to those specified below or which are necessary or required during course of construction to ascertain specification compliance and which may be deemed necessary by Architect, Engineer, or Owner to ensure the quality of the Work.

B. The Owner reserves the right to add to or delete any or all inspection and testing specified, excluding testing required by the applicable building codes.

C. If conflicts arise between Drawings and Specifications, notify Architect immediately. The most stringent requirements shall dictate procedure.

3.3 TESTING OF EARTHWORK

A. Testing Services (As specified or required):
1. References (As applicable for tests required):
   a. American Society for Testing and Materials (ASTM)
      1) D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3)
      2) D2922, Standard Test Method for Density of Soil and Soil-Aggregate In Place By Nuclear Methods (Shallow Depth)
      3) D4318, Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
   b. American Association of State Highway and Transportation Officials (AASHTO)
      1) T89, Determining the Liquid Limit of Soils
      2) T90, Determining the Plastic Limit and Plasticity Index of Soils
      3) T99, Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305-mm (12-in) Drop
      4) T238, Density of Soil and Soil Aggregates In Place By Nuclear Methods (Shallow Depth)
2. Perform sieve analysis to develop grain size distribution curves for materials to be used for subgrade, fill under slab on grade, and backfills.
3. Establish the moisture density relation of soils to be used as fill using the method best suited to the type of fill material.
4. Determine moisture content of all fill materials before placement and advise Contractor when it is or is not suitable to achieve required compaction.
5. Determine Liquid Limit in accordance with ASTM D4318 or AASHTO T89, Plastic Limit in accordance with ASTM D4318, and Plasticity Index in accordance with ASTM D4318 of all fill material,
6. Perform one in place density test for each 4,000 square feet (445 square yards) of existing subgrade material.
7. Perform Moisture-Density curve in accordance with ASTM D698 or AASHTO T99 for one type of fill material. If the original choice of material does not meet the specifications, the Contractor shall pay for additional testing.
8. Perform in place density tests of each lift of compacted fill at locations adequate to evaluate the degree of compaction of all fill areas. Conduct one test for each 4,000 square feet (445 square yards) of each lift of compacted fill.
9. Perform testing at a frequency of one in-place density and moisture test for each 75 lineal feet or less of utility trench, with a minimum of three tests per lift

B. Reports: Submit reports with the following information:
1. Type and condition of soil at footing bottoms.
2. Level of water table in the excavated areas.
3. Grain size distribution of fill materials (average of three tests).
4. Moisture density test results.
5. In place density test results with moisture content and relative density of each layer of compacted fill. Include with in place density test results, a plan showing location of each test.
6. Notify Architect by telephone within one hour of the discovery of the following conditions and follow up telephone notification with written report.
   a. Materials used, or degree of soil compaction not meeting specified requirements.
   b. Frost and freeze protection requirements for excavation bottoms not being complied with.
   c. Water in excavations which is not being removed prior to Work being performed in excavation.

3.4 INSPECTION OF PIPED SITE UTILITIES

A. Laboratory representative shall observe and report on the following:
1. Proper alignment and grade of trenches.
2. Pipe bedding and supports.
3. Pipe, joints, jointing material, and thrust blocks prior to installation of pipe.
4. Installation of pipe and joints.
5. Testing of piped utilities performed by Contractor.

3.5 PAVING

A. Testing Services: Perform field tests for moisture density properties:
   1. Provide field testing of the subgrade as specified.
   2. Paving Subbase: Provide one field test for every 7,500 square feet of area of crushed limestone or caliche subbase.
   3. Lime Treated Subgrade: Provide one field test for every 7,500 square feet of area of lime treated subgrade for content of lime and subgrade compaction.
   4. Cement Soil Stabilization: Provide one field test for every 7,500 square feet of area of cement stabilized subgrade for content of cement and subgrade compaction.

3.6 PIER DRILLING OPERATION

A. A representative of a qualified geotechnical laboratory shall provide services specified.

B. Laboratory representative shall make continuous inspections to determine that proper bearing stratum is obtained and utilized for bearing and that shafts are properly clean and dry before placing concrete.

C. Laboratory shall furnish complete pier log showing the diameter, top and bottom elevations of each pier, casing required or not required, actual penetration into bearing stratum, elevation of top of bearing stratum, volume of concrete used, and deviations from specified tolerances.

D. Laboratory representative shall make continuous inspections of drilled pier construction to check the following:
   1. Verify soundness of bearing stratum and desired penetration.
   2. Verify pier dimensions and reinforcing used.
   3. Monitor condition of hole and removal of water and loose material from bottom.
   4. Monitor placement of concrete and use of tremie or pumps.
   5. Monitor the extraction of casing, if used.

E. Request probe holes when deemed necessary to confirm safe bearing capacity.

3.7 CONCRETE REINFORCING STEEL AND EMBEDDED METAL ASSEMBLIES

A. Inspect concrete reinforcing steel prior to placing concrete for compliance with Contract Documents and approved shop drawings. Noncompliance with Contract Documents and approved shop drawings shall be immediately brought to the attention of the Contractor for correction and, if left uncorrected, reported to the Architect.

B. Laboratory representative shall observe and report on the following:
   1. Number and size of bars.
   2. Bending and lengths of bars.
   3. Splicing.
   4. Clearance to forms, including chair heights.
   5. Clearance to sides and bottom of trench if soil formed.
   6. Clearance between bars or spacing.
   7. Rust, form oil, and other contamination.
   8. Grade of steel.
   9. Securing, tying, and chairing of bars.
   10. Excessive congestion of reinforcing steel.
   11. Installation of anchor bolts and placement of concrete around such bolts.
   12. Fabrication and installation of embedded metal assemblies, including visual inspection of all welds.
   13. Visually inspect studs and deformed bar anchors on embedded assemblies for compliance with Contract Documents. Check number, spacing and weld quality. If, after welding, visual inspection reveals that a sound weld or a full 360 degree fillet has not been obtained for a particular stud or bar, such stud or bar shall be struck with a hammer and bent 15 degrees off perpendicular and then bent back into position. Anchors failing this test shall be replaced.

C. Provide a qualified, experienced inspector to inspect reinforcing steel. Inspector shall have a minimum of three years experience inspecting reinforcing steel in projects of similar size.

3.8 CONCRETE INSPECTION AND TESTING

A. Receive and evaluate proposed concrete mix designs submitted by Contractor. If mix designs comply with Drawings and Specifications, the laboratory shall submit a letter to the Architect certifying compliance. Mix designs not complying with Drawings and Specifications shall be returned by the laboratory as being unacceptable. Check the proposed mixes for proportions, water cement ratio and slump in accordance with ACI 613 and 318.

B. Comply with ACI 311 *Guide For Concrete Inspection* and ACI *Manual of Concrete Inspection* (SP-2).

C. Sample and test concrete placed at the site in accordance with ASTM C172. Each sample shall be obtained from a different batch of concrete on a random basis.

D. Test concrete:
   1. Mold and cure five specimens from each sample.
      a. For each 50 cubic yards or fraction thereof of structural building concrete; and
      b. For each 100 cubic yards or fraction thereof of nonstructural concrete and site Work paving and sidewalks.
      c. Laboratory cure two cylinders in accordance with ASTM C192.
      d. Field cure remaining cylinders in accordance with ASTM C31.

   2. Two specimens shall be tested at seven days for information, two shall be tested at 28 days for acceptance.

E. Deviations from the requirements of ASTM Specifications shall be recorded in the test report. Test concrete specimens in accordance with ASTM C39.

F. Specimens for pumped concrete shall be taken at the discharge end of pumping equipment.

G. Supervise curing and protection provided for test specimens in field, and transportation from the field to laboratory. Test cylinders shall be stored in the field 24 hours and then carefully transported to laboratory and cured in accordance with ASTM C31.

H. Make one strength test (four cylinders) of each mix design of concrete placed in any one day.

I. Make one slump test for each set of cylinders following procedural requirements of ASTM C143 and ASTM C172. Make additional slump tests whenever consistency of concrete appears to vary. Slump tests corresponding to samples from which strength tests are made shall be reported with strength test results. Other slump tests need not be reported.

J. Determine total air content of air entrained normal weight concrete sample for each strength test in accordance with ASTM C231.

K. Determine air content and unit weight of lightweight concrete sample for each strength test in accordance with ASTM C173 and ASTM C567.

L. Determine temperature of concrete sample for each strength test.

M. Inspect each batch of concrete, monitor addition of mixing water to assure uniform consistency from truck to truck. Check mixing form mixers before mix begins to set and within time limits set forth in ASTM C94.
   1. Monitor addition of water and high range water reducer to concrete at job site and length of time concrete is allowed to remain in truck during placement.

N. Testing agency shall furnish and maintain a competent inspector at the mixing plant at the start of each day's mixing. Inspector shall examine concrete materials for compliance with Specifications and approved mix design, weighing and measuring devices, proportioning and mixing of materials, water and cement content of each batch, general operation of the plant, and transportation of concrete to jobsite. Inspector shall verify that amount of free surface moisture contained in fine and course aggregate has been properly accounted for in the concrete mixing to achieve required consistency and water cement ratio.

O. Testing laboratory shall monitor addition of water to concrete at the jobsite and the length of time concrete is allowed to remain in the truck before placement. Inspector shall compare mixture with criteria on the approved mix design and report any significant deviation to the Architect, Contractor and concrete supplier. Do not permit addition of water which will exceed maximum water/cement ratio for the mix as given on the approved mix design.

P. Observe placing of concrete, except nonstructural slabs on grade and site Work. Observe and report on placing method, consolidation, cold joints, length of drop, and displacement of reinforcement. Report deficiencies to Contractor immediately for corrective action. Inspections may be reduced to a periodic basis when all procedures have been deemed satisfactory by the laboratory.

Q. Test reports shall include but no be limited to the following information: date of concrete placement, concrete mix identification number or proportion of ingredients, truck ticket number, time test was made, time of batching, location of each placement, slump, unit weight, water content (microwave test) and air content of concrete sampled and date and results of strength test.

R. Report promptly to Architect all details of reasons for rejection of any and all quantities of concrete. Give all information concerning locations of the concrete pours, quantities, date of pours, and other pertinent facts concerning concrete represented by the specimens.

S. Testing laboratory shall certify each delivery ticket indicating class of concrete delivered (or placed), amount of water added and time at which cement and aggregate were dispensed into the truck, and time at which concrete was discharged from the truck.

T. Evaluation and Acceptance:
1. If measured slump, or air content of air entrained concrete, falls outside specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, concrete shall be considered to have failed to meet the requirements of the specifications, and shall not be used in the structure.
2. Strength level of concrete will be considered satisfactory if the averages of sets of three consecutive strength tests results are equal to, or exceed, specified strength and no individual test result (average of two cylinders) is below specified strength by more than 500 psi.
3. Completed concrete Work will be accepted when requirements of ACI 301 Chapter 18 *Specifications for Structural Concrete for Buildings* have been met.

U. Concrete Test Reports: Reports shall be made and distributed immediately after respective tests or inspections are made.
1. Where reports indicate deviations from Contract Documents, they shall also include a determination of the probable cause of deviation and where applicable, a recommendation for corrective action.

V. Furnish a statistical analysis for each class of concrete placed on the project in accordance with ACI 214 and ACI 318. Information shall be updated and distributed once a month as directed by the Architect. Information shall include, but not be limited to, the following:
1. Strength tests at 7 days of one cylinder.
2. Strength tests at 28 days of two cylinder averages.
3. 28 day moving average strength tests of last three test groups.
4. Standard deviation and coefficient of variation based on 28 day strength tests.
5. Average strength and number of 28 days tests for most recent month.

W. Test Footings (Shafts) (Piers) (Caissons): Same diameter and type specified for footings, placed in same manner. Accepted test footings may be used in the Work.

X. Noncompliant Test Reports: Fax test reports indicating noncompliance immediately to each party on the test report distribution list. Copies shall be on different colored paper.

Y. Inspect application of curing compound and monitor curing conditions to assure compliance with specification requirements. Report curing deficiencies to the Contractor immediately and submit a written report to the Architect.

3.9 TESTING OF NONSHRINK GROUT

A. Make one strength test for all plates grouted and for all grout used in joints between members.

B. Each test shall consist of four cubes, two tested at 7 days and two at 28 days, made and tested in accordance with ASTM C109, with the exception that grout shall be restrained from expansion by a top plate.

3.10 STRUCTURAL STEEL

A. Inspect structural steel during and after erection for compliance with Contract Documents and shop drawings. Review and report on fabricator's quality control procedures and capabilities.

B. Field Inspection:
1. Proper erection of pieces.
2. Proper touch up painting of shop primed structural steel exposed to view or in crawl space.
3. Proper installation of bolts.
4. Plumbness of structure and proper bracing.
5. Proper field painting.
6. Initial inspection of welding process and periodically thereafter as necessary.
7. Visual examination of completed welds.
8. Ultrasonic testing of penetration field welds.
9. Installation of field welded shear studs.
10. Inspect shop fabricated members, upon arrival at the site, for defects incurred during transit and handling.

11. Measure and record camber of beams upon arrival and before erection for compliance with specified camber. Measure lying flat with web horizontal. Return members outside specified camber tolerance to shop for correction.

C. Qualifications of Welders: Fabricator and erector shall provide the testing laboratory with names of welders employed on Work, along with certification that each welder has passed qualification tests within the past 12 months, using procedures covered in AWS D1.1 *Structural Welding Code - Steel*. Verify welder qualifications.

D. Inspection of field welding shall include:
1. Visually inspect fillet welds for size, soundness, and proper return around ends. Inspect seams, folds, and delaminations.
2. Visually inspect welds for proper repair of painting.
3. Ultrasonically test penetration welds in accordance with ASTM E164.
4. Inspect surfaces to be welded. Note surface preparations, fit up, and cleanliness of surface. Verify electrodes for size, type, and condition.
5. Welding inspector shall be present during alignment and fit up of members being welded, and shall verify for correct surface preparation of root openings, sound weld metal, and proper penetration in the root pass. Where weld has not penetrated completely, inspector shall order the joint to be chipped down to sound metal, or gouged out, and rewelded. Thoroughly inspect root passes for cracks. Gouge out cracks and rewelded to 2 inches beyond each end of crack.
6. Inspector shall verify that welds have been marked with welder's symbol and shall mark welds requiring repairs and reinspection. Inspector shall maintain a written record of welds. Work completed and inspected shall receive an identification mark by the inspector. Identify unacceptable material and Work identified by word *reject* or *repair* marked directly on the material.
7. Testing agency shall advise the Owner and Architect of any shop and/or field conditions which may require further tests and examination by means other than those specified. Additional tests and examinations shall be performed as authorized by the Owner and Architect.
8. Owner reserves the right to use ultrasonic or radiographic inspection to verify adequacy of welds. Testing procedures and acceptance criteria shall be as specified in AWS D1.1.
9. Weld quality to comply with the American Institute of Steel Construction (AISC) Manual of Steel Construction.
10. Determine percentage of weld tested by the number of welds that fail the initial testing.
11. Reweld and retest welds that fail until the welds pass. Test two additional welds for every weld failure.

E. Inspect bolted construction in accordance with AISC *Specification for Structural Steel Buildings*:
1. Visually inspect bolts ensuring that plies have been brought into snug contact.
2. Inspect high strength bolt in accordance with Section 9 of the *Specifications for Structural Joints Using ASTM A325 or A490 Bolts*.

F. Inspect stud welding in accordance with Section 7.8, of AWS D1.1 *Structural Welding Code*:
1. Weld at least two shear studs at the start of each production period to determine correct generator, control unit, and stud welder setting. The studs shall be capable of being bent 45 degrees from vertical without weld failure.
2. When the temperature is below 32 degrees F (0 degrees C), test one stud in each 100 after cooling. Do not weld studs at temperatures below 0 degrees F or when surface is wet with rain or snow. If stud fails in the weld, two new studs shall pass the test before resumption of welding.
3. Visually inspect studs for compliance with the requirements of the Contract Documents. Verify number, spacing, and weld quality. If, after welding, visual inspection reveals that a sound weld or a full 360 degree fillet has not been obtained for a particular stud, that stud shall be struck with a hammer and bent 15 degrees off perpendicular in the direction away from the missing weld. Studs failing test shall be replaced.

3.11 REINFORCING STEEL MECHANICAL SPLICES

A. Inspection and Observation Services:
1. Visually inspect and report on completed condition of each mechanical splice of reinforcing steel.
2. Visually inspect each mechanical splice to ensure compliance with the ICC-ES Reports and the manufacturer's published criteria for acceptable completed splices.
3. Place special emphasis on the inspection of the end preparation of each bar to be spliced required by the ICC-ES Report.

B. Reports: Submit reports to Architect:
1. Submit copies of manufacturer's published criteria for acceptable completed splices prior to observing mechanical splices.
2. Reports on each mechanical splice shall indicate location of the splice, size of bars spliced, and acceptability or rejection of splice. Indicate reasons for rejection on each report.

3.12 OPEN WEB JOISTS AND JOIST GIRDERS

A. Inspect joists at jobsite for compliance with specified fabrication requirements. Verify welded connections between web and chord, splices, and straightness of members.

B. Inspect installation of joists at jobsite. Check connections to supporting members, chord extensions, number of rows of bridging, and bridging connections for compliance with Contract Documents and referenced standards.

C. Verify welder qualification certificates for both shop and field welding operators.

3.13 METAL FLOOR DECK

A. Field inspection shall consist of:
1. Verifying types, gauges and finishes for compliance with Contract Documents and shop drawings.
2. Examine composite floor deck exposed to crawl space for damage to galvanizing due to welding or construction activities. Repair galvanized composite floor deck in accordance with the specifications.
3. Examine the erection of metal deck, fastenings, reinforcing of holes, deck reinforcing, miscellaneous deck supports, hanger tabs, shear studs, deck closures, painting or other coating.
4. Certification of welders.
5. Inspect and test field welded shear studs used to fasten metal floor decking to supporting steel as specified for structural steel.

3.14 METAL ROOF DECK

A. Field inspection shall consist of:
1. Verify types, gauges and finishes for compliance with Contract Documents and shop drawings.
2. Examine the erection of the metal deck, including fastenings at supports and side laps, reinforcing of holes, and miscellaneous deck supports.
3. Certification of welders.
4. Visual inspection of at least 25 percent of welds.

3.15 SPRAYED FIREPROOFING

A. Verify applied thickness, density, and bond strength of sprayed fireproofing meets fire rating requirements of approved design.

B. Verify installation complies with fire rating requirements of approved design.

C. Inspect and test for thickness:
1. Test 25 percent of structural frame columns and beams in each building level.
2. Test 10 percent of beams other than structural frame in each building level.
3. Test one slab per 5,000 square feet of building area.

D. Inspect and test in accordance procedures of ASTM E605 and ASTM E736.

3.16 EXPANSION BOLT INSTALLATION

A. Inspect drilling of each hole and installation of each expansion bolt for compliance with Contract Documents and shop drawings.

B. Verify installation torque for each expansion bolt for compliance with manufacturer’s installation instructions.

3.17 LIGHTWEIGHT INSULATING CONCRETE FILL

A. Inspection and Observation Services (As required):
1. Inspection of roof deck prior to start of Work.
2. Inspection during installation of insulation and lightweight insulating concrete fill Work to ascertain compliance with Contract Documents.
3. Observation of base ply fastener pull tests performed by Contractor to ascertain minimum withdrawal resistance of 40 pounds per fastener.

B. Testing Services (As required):
1. References (As applicable for tests required):
a. American Society for Testing and Materials (ASTM)

1) C177, Standard Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties By Means of the Guarded Hot Plate Apparatus
2) C495, Test Method for Compressive Strength of Lightweight Insulating Concrete
3) C578, Specification for Rigid, Cellular Polystyrene Thermal Insulation.

2. Test EPS insulation board for thermal insulation value in accordance with ASTM C177.
3. Test lightweight insulating concrete fill in accordance with ASTM C495 for:
   a. Mix design compressive strength.
   b. Mix design wet and dry density range.
   c. Number of Tests:
      1) One per 5,000 square feet.
      2) Not less than one for each day's Work.

4. Test EPS insulation board for density in accordance with ASTM C578.

3.18 TESTING OF ROOFING

A. Inspection and Observation Services (As required):
1. Inspection of roof deck prior to start of Work.
2. Inspect on site condition of stored roofing materials.
3. Inspection during roofing, roof insulation, and sheet metal Work to ascertain compliance with Contract Documents.
4. Observation of roof test cuts performed by Contractor to ascertain that they are properly made.
5. Observation of patching of roof test cuts to ascertain that they are properly made.

B. Testing Services (As required):
1. Perform dissection and analysis on cuts provided by Contractor to confirm number of plies, bonding of plies, weight of bitumen and softening temperature to ascertain compliance with specifications.

3.19 MASONRY

A. Inspection and Observation Services:
1. Inspection of placement of reinforcement including condition, grade, size, location, spacing, and lap splices.
2. Review mortar design mixes.
3. Inspection of laying, mortaring, and grouting of concrete masonry units and elements.

B. Testing Services:
1. References (As applicable for tests required):
   a. ASTM International (ASTM)
      1) C140, Standard Test Methods of Sampling and Testing Concrete Masonry Units
      2) C780, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
      3) C1019, Standard Test Method for Sampling and Testing Grout
      4) E447-97, Standard Test Methods for Compressive Strength of Laboratory Constructed Masonry Prisms.

2. Testing of Concrete Masonry Units (CMU):
   a. Preconstruction: Perform the following tests in accordance with ASTM C140.
      1) Compressive Strength
      2) Absorption
      3) Weight
      4) Moisture Content
      5) Dimensions.

3. Mortar Tests:
   a. Preconstruction: Perform the following tests in accordance with ASTM C780 on each type of mortar mix used on the Project.
   b. 28 Day Compressive Strength
   c. Water Retention
   d. Construction: Perform 28 day compressive strength test in accordance with ASTM C780 on each type of mortar mix used on the Project at the rate of one test per 2,000 square feet of masonry.

4. Refer to and include Work for reinforcing steel specified.
5. Grout Tests:
   a. Preconstruction: Perform the following tests in accordance with ASTM C1019 on each type of grout mix used on the Project.
      1) 28 Day Compressive Strength

2) Construction: Perform 28 day compressive strength test in accordance with ASTM C1019 on each type of grout mix used on the Project at the rate of one (1) test per 2,000 square feet of masonry.
3) Prism Test: Perform preconstruction 28 day compressive strength test on concrete masonry walls in accordance with ASTM E447-97, Method B.

3.20 REPAIR AND PROTECTION

A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 30.

B. Protect construction exposed by or for quality control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

END OF SECTION 01 45 20

TAB SERVICES PROVIDED BY OWNER

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Owner will employ and pay for the service of an Independent Testing Agency for testing and balancing of HVAC systems.

1. The testing, adjusting and balancing (TAB) of air conditioning systems will be performed by an impartial Independent Technical Firm whose operations are limited only to the field of professional TAB. TAB work shall be done under direct supervision of a professional engineer employed by the TAB firm.
2. The Contractor shall cooperate with the Owner provided TAB firm; provide necessary data on design and proper application of system components; furnish labor and materials required to eliminate any deficiencies or mal-performance.

1.2 RELATED WORK

A. Drawings and General Provisions of the Contract, including General, Supplementary and Other Conditions and Division – 1 Specifications Sections, apply to work of this Section.

B. Refer to Division 23 and Division 26 for testing in conjunction with Mechanical and Electrical work.

1.3 LABORATORY DUTIES AND RESPONSIBILITIES

A. HVAC Testing and Balancing:

1. TAB firm shall act as liaison between Owner, Architect, and Contractor and inspect installation of mechanical piping systems, sheet metal work, temperature controls, and other component parts of heating, air conditioning and ventilating systems. Inspection of work shall cover that part relating to proper arrangement and adequate provisions for testing and balancing.
2. Upon completion of installation and start-up on mechanical equipment, check, adjust and balance system components to obtain optimum conditions in each conditioned space in building. TAB agency to submit to Owner, or Owner's delegated representative, complete reports on the balance and operation of systems.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. HVAC Testing, Adjusting and Balancing

1. Have all systems complete in operational readiness prior to notifying TAB firm that Project is ready for their services, and so certify in writing to Owner that such a condition exists.
2. Make any changes in sheaves, belts and dampers or the addition of dampers required for correct balance as required by TAB firm, at no additional cost to the Owner.

3. Provide and coordinate services of qualified, responsible subcontractors, suppliers and personnel as required to correct, repair or replace any and all deficient items or conditions found during that testing, adjusting and balancing period.
4. In order that systems may be properly tested, balanced and adjusted as required by these specifications, operate said systems for length of time necessary to properly verify their completion and readiness for TAB and pay costs of operations during TAB period.
5. Provide time frame allowance in Contract completions schedule to permit completion of TAB services prior to Owner occupancy.
6. Should TAB be so notified and TAB work commences and the systems are found to not be in readiness or a dispute occurs regarding the readiness of systems, Contractor shall request an inspection be made by a duly appointed representative of Owner, Architect, TAB firm and Contractor. This inspection shall establish to the satisfaction of represented parties whether or not systems meet basic requirements for TAB services. Should inspection reveal TAB services notification to have been premature, Contractor shall pay for costs of the inspection and work previously accomplished by TAB firm. Furthermore, such items as are not ready for TAB services shall be completed placed in operations readiness and TAB services shall again be required.
7. Complete operational readiness, prior to commencement to TAB services shall include the following:
   a. Construction status of building permits closing of doors, windows and ceilings installed to obtain projected operational conditions.
8. Air Distribution Systems:
   a. Verify installation for conformity to design. Supply, return and exhaust ducts terminated and pressure tested for leakage as required by Specifications.
   b. Volume and fire dampers properly located and functional. Dampers serving requirements of minimum and maximum outside air, return and relief, shall provide tight closure and smooth operation.
   c. Supply, return, exhaust and transfer grills, registers, diffusers and terminal units installed.
   d. Air handling systems, units and associated apparatus, such as filter sections and access doors, shall be blanked or sealed to eliminate excessive bypass or air leakage.
   e. Fans (supply, return, and exhaust) operating and verified for freedom from vibration, proper fan rotation and belt tension; heater elements shall be proper size and rating; record motor amperage and voltage and verify name plate ratings are not exceeded.

9. Water Circulating Systems:
   a. Check and verify pump alignment and rotation.
   b. Position and valves pertinent to system design and require operation to permit full flow of water through system components. Operate hydronic systems under full flow conditions until circulating water is clean. Strainers shall be removed and cleaned as required during this cycle of operation.
   c. Record each pump motor amperage and voltage. Readings shall not exceed nameplate rating.
   d. Verify electrical heater elements to be of proper size and rating.
   e. Water circulating systems shall be full of water and free of air, expansion tanks set for proper water level and air vents installed at high points of systems and operating freely.
   f. Check and set operating temperature of heat exchangers to design requirements.
   g. Contractor to provide labor and chemical to clean and flush all chill water piping system. Contractor to coordinate with treatment provider to be sure chemicals used are compatible with owner's providers.
10. Automatic Controls:
   a. Verify that control components are installed in accordance with Project requirements and functional, including electrical interlocks, damper sequences, firestats, CO2 sensors, and smoke detectors.
   b. Controlling instruments shall be functional and set for designed operating conditions. Factory pre-calibration of thermostats will not be acceptable.
   c. Temperature regulation will be adjusted for proper relationship between controlling instruments and calibrated by control subcontractor using data submitted by TAB firm. The correctness of final setting shall be proved by taking hourly readings for a period for three (3) successive 8-hour days in a typical room on each separately controlled zone. Total variation shall not exceed two (2) degrees from present median temperature during entire temperature survey period.
11. TAB firm will not instruct or direct Contractor in any of the work, but will make such reports as are necessary direct to Owner. Plans and miscellaneous adjustment devices for purpose of adjustment to obtain optimum operation conditions; install these devices in a manner that will leave them accessible and readily accessible, provide access as required by TAB firm.
12. .
13. Provide approved submittal data on equipment installed and related changes required to accomplish test procedures outlined in this Section of the Specification.
14. Transmit one (1) copy of the following 'Record for Owner' to TAB firm for review and comments:
   a. 'As installed' drawings.

b. Approved Fixture Brochure.
c. Approved Wiring Diagrams.
d. Approved Control Diagrams.
e. Approved Sequence of Operations
f. Shop Drawings.
g. Instructions.
h. Valve Charts.
i. Approved submittals for equipment, devices and accessories

1.5 Typical TAB Agency duties for HVAC TESTING, ADJUSTING AND BALANCING

A. Testing and Balancing Air Systems:

1. Test and adjust air systems to conditions set forth in Plans and Specifications. Air systems include:
   a. Supply Air Systems.
   b. Return Air Systems.
   c. Exhaust Air Systems.
2. In fan systems, air quantities indicated on Plans may be varied as required to secure a maximum temperature variation of two (2) degrees within each controlled space, but total air quantity indicated for each zone must be obtained.
3. Test and adjust blowers and fan to deliver CFM required by systems with concurrent recording of RPM, supply voltage and full load amperes. Report any changes of belts and sheaves required.
4. Mark pitot tube traverses of main supply, return and exhaust ducts and adjust fans and dampers to achieve specified air volumes. Patch and cover the pilot tube holes after air balancing is complete.
5. Test and adjust fresh air intake and return air dampers and louvers to conditions scheduled or required.
6. Test and record static pressure on entering and leaving side of each supply fan, exhaust fan filter, coil and balancing dampers and other components of the system.
7. Test and adjust supply air diffusers, grills, and return air registers to Specification requirements and as shown on Drawings. Adjust supply diffuser patter blades for proper air distribution in each room or space.
8. Measure temperature in each space and concurrent outside temperature.

B. Testing and Adjusting of Water System:

1. Flow of water through water coils shall be adjusted by adjusting valves until rated pressure drop across each coil is obtained and water flow verified by veturi readings. On those with three-way valves, rated pressure drop shall first be adjusted though coils in each of several systems and the temperature differential between inlet and outlet shall be determined to be in accordance with its rating. Bypass valves shall then be adjusted on each coil until an equal pressure drop between supply and return

connections is obtained with three-way valves set to bypass all coils in each of the several systems.

2. Geothermal Heat Pumps TAB shall be performed with a single unit per well field operating. This single unit balancing shall include both the air side, particularly the outside air, and the water side.

C. Testing and Adjusting of Automatic Controls:
   1. Test automatic controls, controlled devices, interlocks, safety devices associated with HVAC system for proper operation and sequence during heating, cooling, intermediate and smoke removal modes of operation. Adjust automatic controls to deliver required quantities of air at temperatures specified or scheduled on Plans and to maintain proper conditions in each room of the building.
   2. Report deficiencies or malfunctions to Owner or owner's representative.

D. Marking of Settings:
   1. Before final acceptance of reports is made, TAB firm shall furnish Owner the following data:
      a. Summary of main supply, return and exhaust dust pilot tube traverses and fan settings indicating minimum value required to achieve specified air volumes.
      b. A tabulated record of temperature in all spaces on each separately controlled zone, together with outside temperature at time of measurement.
      c. A list of measured air quantities at each outlet corresponding to temperature tabulation specified above.
      d. Air quantities at each return and exhaust air-handling devices.
      e. Supply pressure readings entering and leaving each supply fan, exhaust fan, filter, balancing dampers and other components of system. These readings shall be related to fan curves in terms of CFM handled.
      f. Motor current readings per phase at each equipment motor. Voltage at time of reading shall be listed.
      g. Water pressure reading at gauge connections. Pressure readings at coils and pumps shall be related to coil and pump curves in terms of GPM flow through metering stations at each coil if applicable.
      h. Water temperature readings entering and leaving each coil and heat exchanger under maximum load conditions in each case.
   2. The final report shall certify test methods and instrumentation used, final velocity ready obtained, air quantities at each outlet supply, return, exhaust, temperature, pressure drops, RPM of equipment, amperage of motors, air balancing problems encountered, recommendations and uncompleted punch list items.
   3. A summary of actual operating conditions shall be included on each system outlining normal and/or ventilation cycles of

operation. The intent of final report will provide a reference of actual operating conditions for Owner's operating personnel.

4. ‘
5. Insure that all systems area balanced at the proper time in the opposite season.

PART 2 PRODUCTS (Not Applicable)

End of Section 01 45 23 01

PART 1 SERVICES - GENERAL

1.1 WORK INCLUDES

A. This Section specifies administrative and procedural requirements for testing and inspection services.

B. Services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.
2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
3. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 RESPONSIBILITIES

A. Contractor Responsibilities: The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity; these services include those specified to be performed by an independent agency and not by the Contractor. Costs for these services shall be included in the Contract Sum.

1. The Contractor shall employ and pay an independent agency, to perform specified quality control services specified in PART 1 - GENERAL, QUALITY ASSURANCE. The cost for these services is not borne by the testing allowance.
2. The Owner will engage the services of an independent agency to perform inspections and tests specified in PART 3 - EXECUTION, QUALITY CONTROL, QUALITY CONTROL TESTING DURING CONSTRUCTION or FIELD QUALITY CONTROL.
3. Where the Owner has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity

engaged by the Owner, unless otherwise agreed in writing with the Owner.

4. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
5. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.
6. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
    a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
    b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
    c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
    d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
    e. Security and protection of samples and test equipment at the Project site.

B. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.
    1. The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility.
    2. The Owner will employ and pay for the services of an independent Commissioning Agent,TAB services, and Material Testing services.

C. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.
    1. The agency shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
3. The agency shall not perform any duties of the Contractor unless informed in writing by the owner or owner's representative.

D. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. Additionally, Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
   1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.3 SUBMITTALS

A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Architect, in duplicate or pdf format, unless the Contractor is responsible for the service. If the Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate and pdf format.

B. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

C. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
   1. Date of issue.
   2. Project title and number.
   3. Name, address and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making the inspection or test.
   6. Designation of the Work and test method.
   7. Identification of product and Specification Section.
   8. Complete inspection or test data.
   9. Test results and an interpretation of test results.
   10. Ambient conditions at the time of sample-taking and testing.
   11. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting.

1.4 QUALITY ASSURANCE

A. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.
   1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

1.5 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements at no additional cost to the Owner.
B. If, in the opinion of the Architect/Engineer or Owner, it is not practical to remove and replace the Work, the Architect or owner's representative will direct appropriate remedy or adjust payment.
C. The defective Work may remain, but sum/price will be adjusted to new sum/price at the discretion of Architect or Owner.
D. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.
E. Authority of Architect/Engineer, or other appropriate agent identified to perform assessment by the Architect/Engineer or Owner, to assess defects and identify payment adjustments, is final.
F. Non-Payment For Rejected Products: In addition to replacement of rejected Work, payment will not be made for rejected products for any of the following:
    1. Products wasted or disposed of in a manner that is not acceptable.
    2. Products determined as unacceptable before or after placement.
    3. Products not completely unloaded from transporting vehicle.
    4. Products placed beyond lines and levels of required Work.
    5. Products remaining on hand after completion of the Work.
    6. Loading, hauling, and disposing of rejected products.

PART 3 - EXECUTION

3.1 SCHEDULE OF INSPECTIONS AND TESTS

Any conflicts with the information below with current best practices, building code requirements, jurisdictional requirements or other agreements the more stringent applies.

A. Soils Tests:
    1. Soil Analysis Method: Make one test for each type of soil used under structures and paving.
        a. Liquid Limit ASTM 04318.
        b. Plastic Limit: ASTM 04318.
        c. Plasticity Index: ASTM 04318.
        d. Moisture-Density Relationship: ASTM 0698 or ASTM D4253, 04254 as applicable.
        e. In-Place Density: ASTM 02922.
        f. One laboratory maximum density test.
    2. Quantity of Analysis: One set for each 5000 sf for each lift
        a. Perform in-place density tests on fill material at building, paving, and utility trenches.
B. Soil Stabilization:
    1. Required Analyses for Fill
        a. Liquid Limit ASTM 04318.
        b. Plastic Limit, Plasticity Index ASTM 04318.
        c. Moisture-Density Relationship: ASTM 0698 or ASTM 04253, 04254 as applicable.
        d. In-Place Density: ASTM 02922.

2. Quantity of Analyses: One set for each 5000 square feet.

C. Portland Cement Concrete Paving:
   1. Three (3) concrete test cylinders will be taken for every 100 or less cubic yards of concrete placed.
   2. One (1) additional test cylinder will be taken during cold weather concreting, and be cured on jobsite under same conditions as concrete it represents.
   3. One (1) slump test will be taken for each set of test cylinders taken.
   4. One (1) set of manufacturer's test data will be required of Contractor for each type reinforcing steel purchased directly from a United States mill.
   5. One (1) set of tension and bending tests on three separate samples for each bar size of each 5 tons of each type reinforcing steel specified.
   6. Cylinder Curing: ASTM C31.
   7. Testing Cylinders: ASTM C39. Test one cylinder for compression at 7 days, one at 28 days, hold one cylinder for testing at 56 days if 25 day test does not meet specified compression strength.
   8. Report test results promptly. ASTM C94 governs acceptance of tested concrete.
   9. Drill and test cores as required when 28-day test results fall below specified strengths. Contractor shall pay for drilling and testing cores.

D. Asphalt Pavement:
   1. Verify Contractor's mix design for compliance.
   2. Required Plant Sampling and Testing
      a. Sieve Analysis of Aggregates ASTM C136.
      b. Sampling Mineral Aggregates: ASTM D75.
      c. Sieve Analysis of Mineral Filler: ASTM D546.
      d. Specific Gravity of Coarse Aggregate: ASTM C127.
      e. Specific Gravity of Fine Aggregate: ASTM C128.
      f. Sampling Bituminous Materials: ASTM D140.
      g. Sampling Bituminous Mixtures: ASTM D979.
      h. Determination of Bitumen Content: ASTM D2172.
      i. Liquid Limit, Plastic Limit, Plasticity Index: ASTM D4318.
      j. Percentage of Coated Particles: ASTM D2489.
      k. Recovery of Extracted Asphalt: ASTM D1856
      l. Penetration of Recovery Asphalt: ASTM D5
      m. Percent of Air Voids in a Compacted Bituminous Paving Mixture: ASTM D3203.
      n. Absolute Viscosity of Asphalts: ASTM D2171.
      o. Cohesion, Resistance to Deformation: ASTM D1560.

E. Field Density Tests: ASTM D2950.
      a. Locations: Subgrade, base courses, surface course.
      b. Number: One for each 1,000 square yards or fraction thereof.
      c. Field Thickness: ASTM D3549.

F. Drilled Footing Inspection:
    1. Soil Shear Strength Test: Test sample of cuffing from each drilled footing with a pocket penetrometer to determine shear strength and compare with anticipated strength presented in the soil report.
    2. Visual Inspection: Determine that cutting tool is set for the correct size. Inspect each drilled footing to determine if the bottom of the excavation is in intended strata of soil type and is free of loose dirt and sand. Notify Architect and Geotechnical Engineer if water is encountered.
    3. Reinforcing Steel: Inspect the reinforcing steel to determine if the size and number of reinforcing bars complies with the specifications and drawings.
    4. Maintain record of footing depth and variations of installation if footing placement requires deviation from Contract Documents.

G. Structural Concrete:
    1. Aggregate Tests:
        a. Typical: Check the proposed aggregate in accordance with ASTM C33.
        b. For concrete 6000 psi and higher, perform ASTM 0799 also.
    2. Mix Design: Check the proposed mixes for proportions, water cement ratio and slump in accordance with ACI 301 and 318.
    3. Slump Tests: Take slump tests per ASTM C143 at the beginning of each day's placing operations and whenever water adjustments or noticeable change of slump occurs, with a minimum of one for each set of test cylinders.
    4. Sampling:
        a. Make five standard cylinders at the beginning of each placement, and five more standard cylinders for every 50 cubic yards placed. Take extra samples at noticeable change in the concrete makeup. Cure per ASTM C192.
        b. Determine and report air content per ASTM C231, 0173, or 0138 for each set of test cylinders.
        c. Perform sampling in compliance with ASTM 0172.
        d. Samples for pumped concrete to be taken at end of line, at location of placement.
    5. Testing:
        a. Test cylinders for compression in accordance with ASTM 039.
        b. Test two lab cured cylinders at 7 days and two field cured cylinders at 28 days averaging test results. Store one (1) cylinder for testing at 56 days in the event the 28 days strength tests do not meet strength requirements.

H. Reinforcing Steel:
    1. Visual Inspection: Inspect reinforcing steel in structural concrete to determine if the size, type, splices, laps, clearances, and number of reinforcing bars complies with the specifications and drawings.

I. Bolted Connections:
    1. Types:
        a. Calibrated torque wrench if washers are used.
        b. If turn of nut method is used without washers, observe the set of every bolt.
    2. Number for Torque Wrench Test: Test minimum two bolts of every third connection between floor beams, girders and columns.
    3. Analysis: If insufficient torque occurs on any tested bolt, test all bolts at that connection at the Contractor's expense.

J. Steel Weld Tests:
    1. Types: One of the following testing procedures may be used on any field or shop weld.
        a. Liquid penetrant.
        b. Magnetic particle.
        c. Radiographic.
        d. Ultrasonic.
        e. Visual inspection at small welds.
    2. Number of Tests: 100% of full penetration and field welds, 10% of other shop welds. Test of shop welds shall be done at fabricator's shop prior to painting and shipping.
    3. Number of Retests: Number of welds to be retested will be determined by the number of welds that fail the initial testing.
    4. All welds that fail shall be re-welded and retested until they pass the test. 5. Test two additional welds for every weld failure at the Contractor's expense.
    5. Weld Quality: Comply with the quality requirements of the American Institute of Steel Construction Manual of Steel Construction.
    6. Testing Laboratory shall obtain and review copy of certification of all welders.

K. Insulating Concrete:
    1. Type of Tests:
        a. Field Wet Density: ASTM C138.
        b. Laboratory Tests: Dry density and compressive strength ASTM C495.
    2. Number of Test Sets:
        a. One per 5,000 square feet.
        b. Not less than one for each day's work.

End of Section 01 45 23 02

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections:

1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.
2. Division 32 Section "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.3 DESCRIPTION OF REQUIREMENTS.

A. Connections for temporary and permanent utilities and payment for temporary utilities services required for the Work are the responsibility of the Contractor. Contractors performing renovation work or additions to existing campuses may request a variance on usage to be delivered in writing from the owner or owner's representative via email. Cost or use charges for temporary services or facilities will not be accepted as a basis of claims for a Change Order. Temporary utilities services required for use at the project site include but are not limited to the following:
   1. Water service.
   2. Temporary electric power and light.
   3. Telephone service.
   4. Provide adequate utility capacity at each stage of construction.
   5. Prior to availability of temporary utilities at the site, provide trucked-in-services for start-up of construction operations.

B. Temporary construction and support facilities required for new construction and additions to existing campuses include but are not limited to the following:
   1. Temporary heat.
   2. Field offices and storage sheds.
   3. Sanitary facilities, including drinking water, handwashing.
   4. Dewatering facilities and drains.
   5. Temporary enclosures.
   6. First aid station, including eye wash station.
   7. Project identification, bulletin boards and signs.
   8. Waste disposal services.
   9. Rodent and pest control.
   10. Construction aids and miscellaneous general services and facilities.
   11. Alternate temporary services and facilities, equivalent to those specified, may be used, subject to acceptance by the Architect/Engineer and owner's representative.

C. Security and protection facilities and services required for Project include but are not limited to the following:

1. Temporary protected interior walkway between occupied building areas.
2. Dust barricade between occupied building areas and work areas.
3. Temporary fire protection.
4. Barricades, warning signs, lights.
5. Sidewalk bridge or enclosure fence for the site.
6. Environmental protection.
7. Alternate security and protection methods or facilities, equivalent to those specified, may be used, subject to acceptance by the Architect/Engineer and owner's representative.
8. The Contractor shall provide a temporary barrier whenever a certain area of the school is sealed off for remodeling work for phasing purposes. The barrier shall be made of 3/4" plywood or drywall, and it shall extend from floor to ceiling, wall to wall. The temporary barrier shall have a door which can be locked. This barrier will remain until work in the specified area is completely finished. The barrier may subsequently be moved to a different location, provided that it still meets the requirements. Proper signage should be displayed near the temporary barrier, according to safety regulations. Any temporary barriers will need to be coordinated with the emergency egress plan of the building.
9. Barrier requirements for minor renovation work will be discussed and agreed upon at weekly progress meetings.

1.4 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to Owner, Program Manager, Architect, testing agencies, and authorities having jurisdiction.
B. Sewer Service: Owner will pay sewer service use charges for sewer usage by all entities for construction operations.
C. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.5 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, temporary barricades, site entrance, utility hookups, staging areas, and parking areas for construction personnel. Submit for approval within 7 days of NTP by Architect/Engineer and/or owner's representative using specification 01 33 00 submittal procedures.
B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent. Submit for information to Architect/Engineer and/or owner's representative using specification 01 33 00 submittal procedures.
C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials. Submit for

information to Architect/Engineer and/or owner's representative using specification 01 33 00 submittal procedures.

1. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

D. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Submit for approval by Architect/Engineer and/or owner's representative using specification 01 33 00 submittal procedures. Include the following:

1. Locations of dust-control partitions at each phase of the work.
2. HVAC system isolation schematic drawing.
3. Other dust-control measures.
4. Waste management plan.

1.6 QUALITY ASSURANCE

A. Regulations: Comply with requirements of local laws and regulations governing construction and local industry standards, in the installation and maintenance of temporary services and facilities, including but not limited to the following:

1. Building Codes, including local requirements for permits, testing and inspections.
2. Health and safety regulations.
3. Utility company regulations and recommendations governing temporary utility services.
4. Police and Fire Department rules and recommendations.
5. Environmental protection regulations governing use of water and energy, and the control of dust, noise and other nuisances.
6. In addition, comply with "Environmental Impact" commitments the Owner or previous Owners of the site may have made to secure approval to proceed with construction of the Project.

B. Standards: Comply with the requirements of NFPA Code 241, "Safeguarding Construction, Alterations, and Demolition Operations", the ANSI A10.6 "Safety Requirements for Construction and Demolition", and the NECA National Joint Guideline NJG-6 "Temporary Job Utilities and Services".

C. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", as prepared jointly by QUOIN and ASC for industry recommendations.

D. Inspections: Inspect and test each service before placing temporary utilities in use. Arrange for require inspections and tests by governing authorities, and obtain required certifications, and permits for use.

E. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

1.7 PROJECT CONDITIONS

A. General: Provide each temporary service and facility ready for use at each location when the service or facility is first needed to avoid delay in performance of the Work. Maintain, expand as required and modify temporary services or facilities as needed throughout the progress of the Work. Do not remove until services or facilities are no longer needed, or are replaced by the authorized use of completed permanent facilities.

B. Conditions of Use: Operate temporary services and facilities in a safe and efficient manner. Do not overload temporary services of facilities, and do not permit them to interfere with the progress of the Work. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.

C. Temporary Utilities: Do not permit the freezing of pipes, flooding or the contamination of water sources.

D. Security and Protection: Maintain site security and protection facilities in a safe, lawful and publicly acceptable manner. Take necessary measures to prevent erosion of the site.

E. The roof removal and new roof installation shall proceed on a phased basis to minimize risk to the School's ongoing operations and its property. The GC shall be responsible for protection of interior spaces from damage during roofing work.

F. Distribute material, debris, and equipment over the roof deck to avoid damage to the structural deck. Not more than two weeks supply of material shall be stored on a roof at any given time. Place materials and equipment to be stored on the roof as nearly direct over structural members as can be determined. Secure equipment, material, and debris on the roof to prevent movement by wind or other elements. Contractor assumes full responsibility for loading on the structural deck or roofing materials during roof replacement operations.

G. Consult with the A/E and the owner’s representative regarding permission for the use of selected areas of the building. Coordination will also be held with the Principal and / or site staff.

H. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

I. The projects requiring new paved entries, parking lots, or other paving work in excess of 10,000 square feet will consider the work to be critical path. A phasing schedule for installation will be submitted by contractor within seven (7) days of NTP for review by Architect/Engineer and/or owner’s representative using the owner’s designated software via a transmittal.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Provide new materials and equipment for temporary services and facilities; used materials and equipment that are undamaged and in serviceable condition may be used, if acceptable to the Architect/Engineer and/or owner’s representative. Provide only materials

and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards.

B. Portable Chain-Link Fencing: Minimum 2-inch 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized steel bases for supporting posts.
C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10 mils minimum thickness, with flame-spread rating of 15 or less per ASTM E 84.
D. Dust Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60.

2.2 TEMPORARY FACILITIES

Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

A. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, PM, Architect, and construction personnel office activities and to accommodate project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
    1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
    2. Conference room of sufficient size to accommodate meetings of 8 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table that will seat 10 attendees, chairs, and 4-foot-square tack and marker boards.
    3. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
    4. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
    1. These shall be weather tight, structurally sound, compliant with applicable codes and shall be secure
    2. Store combustible materials apart from building.
C. Temporary Construction and Support Facilities: Provide facilities that can be maintained properly throughout their use at the Project site.
D. Self-Contained Toilet Units:
    1. Sanitary facilities include temporary toilets, with facilities and drinking water fixtures. Comply with governing regulations including safety and health codes for type, number, location, operation, and maintenance of fixtures and facilities; provide not less than specified requirements. Install in locations that will best serve the Project's needs.
    2. Provide single-occupant self-contained toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or

similar non-absorbent material. Provide at least one for every thirty (20) employees.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures. Provide quantity and type to comply with all local, state, and federal safety codes.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction. All return grilles will be replaced upon completion of project if used during construction.
4. Temporary Chiller: If existing chiller is out of use for more than 72 hours, provide temporary chiller to prevent mold from developing.
    a. Temporary air-cooled chiller shall have a net cooling capacity of 225 tons at a 105 deg. F ambient temperature.
    b. Provide temporary chiller with integral primary chilled water pump for pumping through the chiller primary loop

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition

better than or equal to existing before initial use. If services do not exist Contractor shall provide.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
    1. Prior to commencing work, isolate the HVAC system in area where work is to be performed in accordance with approved coordination drawings.
        a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
        b. Cover all supply and return grills left in place with plastic to prevent dust intrusion.
        c. Maintain negative air pressure within work area using HEPA-equipped air filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
    2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust containment devices.
    3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
    4. Fire alarm system may be required to be put in test mode temporarily, if site conditions warrants it.

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
    1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

H. Electric Power Service: Connect to Owner's existing electric power service if available with written permission from owner or owner’s representative. Maintain equipment in a condition acceptable to Owner. Electrical power service to the project office trailer and other elements and areas of the Contractor’s office and staging area is to be provided by the Contractor by means of a temporary power service with a temporary account separate from the facility electrical power service for new construction projects.

I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
   2. Install lighting for Project identification sign.

J. Telephone Service: Provide Wi-Fi service in common-use facilities for use by contractor, architect, owner and owner's representative. Passwords will be provided at first OAC meeting following installation and setup of Wi-Fi system.
   1. Provide superintendent and other contractor management staff with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Provide construction temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
   2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Parking: Provide five (5) designated, accessible, and secure parking spaces nearest to the project or job trailer for the A/E, owner, and/or owner's representative. Provide temporary parking areas for construction personnel.

C. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
   1. Identification Signs: Provide Project identification signs as indicated in this section.
   2. Temporary Signs: Provide other signs as indicated and as required to inform the public and individuals seeking entrance to Project.
      a. Provide temporary, directional signs for construction personnel and visitors.
      b. Provide warning signs to students, staff, pedestrians, visitors and others for any closed or impeded paths to access and egress in or around the immediate site.
   3. Maintain and touchup signs so they are legible at all times.
   4. No other signs shall be allowed on site with the exception of those that are safety oriented. No signs serving as advertisement shall be allowed.

D. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
   1. Do not load elevators beyond their rated weight capacity.

2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

E. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to better than or equal to condition existing before initial use.
   1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

F. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

H. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings. Provide coordination drawings when applicable with locations of proposed areas to A/E and/or owner’s representative via transmittal in owners designated software.
   1. Construct covered walkways using scaffold or shoring framing.
   2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
   3. Paint and maintain appearance of walkway for duration of the Work.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather tight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

J. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate occupied areas fumes and noise. Provide coordination drawings when applicable with locations of proposed areas to Architect and/or owner’s representative via transmittal in owners designated software.
   1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.

2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
3. Insulate partitions to control noise transmission to occupied areas.
4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
5. Protect air-handling equipment.
6. Provide walk-off mats at each entrance through temporary partition.

K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241. Provide coordination drawings when applicable with locations of proposed areas to Architect and/or owner's representative via transmittal in Kahua .
   1. Prohibit smoking on school property per State Law.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
   4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.4 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
   1. Protect porous materials from water damage.
   2. Protect stored and installed material from flowing or standing water.
   3. Keep porous and organic materials from coming into prolonged contact with concrete.
   4. Remove standing water from decks.
   5. Keep deck openings covered or dammed.
C. Any new construction materials with visible moisture damage or mold contamination will be removed from the project and replaced at contractors cost.
D. Any existing surfaces suffering moisture damage or mold contamination during construction will be the responsibility of the contractor. Surfaces will be cleaned, replaced, or remediated to owner's satisfaction.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
B. Maintenance: Maintain facilities in good operating condition until removal.
C. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
    1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

End of Section 01 50 00

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 00 and 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. Section includes requirements for temporary facilities (Swing Space) for the purpose of relocating students to provide temporary classroom facilities during construction activities.

B. Related Sections:

1. Division 00 Section titled “Technical Proposal”
2. Division 01 Section title “Temporary Facilities and Controls”

1.3 DESCRIPTION OF REQUIREMENTS

A. The project management team are to determine whether Swing Space is necessary in order to accommodate the phasing and construction of the project. If students must be displaced from classroom areas due to the phasing and execution of the work according to the Contractor’s work plan, the Contractor shall be responsible for providing, on a turn-key basis, temporary facilities for those displaced students. It will be the responsibility of the Contractor to determine the size and layout of the space based on the particular need and in a manner that will create an adequate classroom facility for the students displaced. Every effort shall be made to avoid temporary portables as swing space, unless there are already in existence at the school, unused. Contractor, PM, and Architect must work with School Principal to find swing space within the school by accommodating school master schedule and space allocation.

B. If the Contractor elects to utilize Swing Space, they must include all costs associated with the procurement including, but not limited to:

1. Equipment purchase or leasing
2. Transport and setup
3. Maintenance of the temporary facilities for the duration of their use (i.e. HVAC, electrical, and other building repair and maintenance needed, not custodial maintenance)
4. Site work and utilities
5. ADA/TAS Accessible ramps and sidewalks
6. Stairs
7. Skirting
8. Interior finish-out
9. Miscellaneous specialties (i.e. marker boards, tack boards, flag holders, map clips, fire extinguishers)
10. Signage
11. Wall Clock and bell to interface with the existing system at the school
12. Furnishings, Fixtures, and Equipment (FF&E)
13. Breakdown, removal, and transport of the Swing Space at the completion of its use
14. Restoration of the site following removal of facilities
15. P.A. to interface with the existing system at the school

16. Data cabling from existing school network electronics sufficient to provide two data drops at each Teacher's desk location.

1.4 SCOPE OF WORK

Provide turnkey services for delivery, set-up, maintenance, removal, and restoration of the site for temporary classroom buildings to accommodate phased construction.

A. Engineering: The Contractor will provide site engineered civil, utility, blocking plan/foundation plan, sidewalk design and deck/ramp design sufficient to receive a Building Permit from the municipality having jurisdiction, for each site for the installation of all temporary classroom buildings.
B. Architectural: The Contractor will provide the building manufacturer's shop drawings approved by the Texas Department of Licensing and Regulation (TDL&R). The Contractor will coordinate T.A.S. submittals to the State and the City as they relate to this scope of work.
C. Permits: The Contractor will coordinate and obtain the permits as required by the City for placement of the classroom buildings at each site. This includes the permits required for the transportation of the classroom buildings.
D. Temp. Facilities: Roll off dumpsters will be provided by the Contractor as required for clean-up during installation and removal of swing space.
E. Clean up: Final broom sweep of the building(s) and removal of trash and debris from each site will be provided by the Contractor prior to occupancy of the swing space by the students and staff. Floor waxing or shampooing will be provided be the Contractor prior to occupancy by the students and staff if needed. Provisions for site restoration upon completion of the delivery of the modules and/or completion of the scope of work will be provided by the Contractor. Upon the removal of the buildings all underground utilities and/or structures associated with the temporary classroom buildings will be removed and discarded. The concrete sidewalks will be removed and discarded. Rough grading will be performed and new sod will be placed to restore the area to its original condition.
F. Site Prep: FBISD has made no provisions for any site preparation and/or demolition as may be required for the delivery and/or installation of the portable buildings. Any site preparation and/or demolition that might be required of for installation of the temporary classrooms will be included in the Contractor's scope.
G. Construction Fencing: The contractor will maintain a clean and safe site environment within the limits of the temporary classroom construction area. Temporary chain link construction fencing 6' high will be installed around the perimeter of the limits of construction.
H. Sodding: Upon the removal of the buildings, the Contractor will provide sod within the limits of construction associated with the temporary classroom scope of work. Any irrigation of the new sod will be provided by FBISD.
I. Site Utilities (if applicable): The Contractor will provide the site utility connections as required for the temporary classroom buildings. If needed,

PM shall negotiate with municipalities having jurisdiction obtaining a variance to the FBISD in which the swing space facilities are not required to have restroom facilities. If required by those municipalities, the Contractor must provide restroom services and utilities as required by local code.

J. Storm: All storm water management and any sedimentation control will be the responsibility of the Contractor. Gutters and downspouts will be installed as needed by the Contractor.
K. Sanitary (if applicable): The Contractor will install all fixtures, stub all sanitary lines below the floor and manifold to one location at the edge of the building(s). All final connections, utility company charges and impact fees that might be required will be included in the Contractor's scope of work. If needed, PM shall negotiate with municipalities having jurisdiction obtaining a variance to the FBISD in which the swing space facilities are not required to have restroom facilities. If required by those municipalities, the Contractor must provide restroom services and utilities as required by local code.
L. Water (if applicable): The Contractor will install all fixtures and stub all water lines to one location at the edge of the building(s). All final connections, utility company charges and impact that might be required will be included in the Contractor's scope of work. If needed, PM shall negotiate with municipalities having jurisdiction obtaining a variance to the FBISD in which the swing space facilities are not required to have restroom facilities. If required by those municipalities, the Contractor must provide restroom services and utilities as required by local code.
M. Natural Gas: No provisions for any gas service are anticipated for FBISD Projects.
N. Life Safety: Building(s) will be approved and inspected by the Texas Department of Licensing and Regulation. Any provisions for fire suppression, fire sprinkler system or fire rated assemblies that might be required will be included in the Contractor's scope of work.
O. Fire Alarm: The contractor will provide and install fire detection systems as required by the building code and the City.
P. Electrical: The contractor will provide and install electrical systems as required by the building code and the City. Temporary electricity costs associated with the swing space will be the financial responsibility of the Contractor unless otherwise directed by the owner in writing.
Q. Mechanical: The Contractor will supply and install the standard end mount HVAC units as provided by the portable building manufacturer. The condensate from both HVAC units of a classroom building will harnessed together and discharged into a 24" diameter by 36" deep french drain filled with gravel. All condensate piping will be PVC but will be protected where directly exposed to UV radiation.
R. Skirting: After the modules are installed, the Contractor will install full perimeter skirting around the building(s) using the same material and finish as that of the building siding to provide a consistent finish down to grade. Sections of skirting will be perforated as required for proper crawl

space ventilation. Access to the crawl space will be accomplished by removing sections of the skirting.

S. Decks/Stairs: The Contractor will install landings at the exit doors of the building(s) within the limits of construction as required by code and the City. Landings will utilize pressure treated wood construction with slip resistant surface treatment and handrails.

T. Ramps: The Contractor will install handicapped accessible ramps at the exit doors of the building(s) within the limits of construction as required by code and the Local City. Ramps will utilize pressure treated wood construction with slip resistant surface treatment and handrails.

U. Sidewalks: The Contractor will install 4' wide, 4" thick, 3,000 psi concrete sidewalks using 6x6 welded wire reinforcing to service the building(s) within the limits of construction. Sidewalks will receive a light broom finish and be poured on select fill and/or sand bed.

V. Foundation and Anchorage: The swing space facilities should be securely anchored to a foundation system which utilizes some means of structural support, as determined by a certified structural engineer. Provide construction documents that depict the foundation system as designed and certified by a structural engineer. The portable buildings shall be anchored to the foundation components in a manner that is structurally sound and that is acceptable to the building manufacturer and the structural engineer.

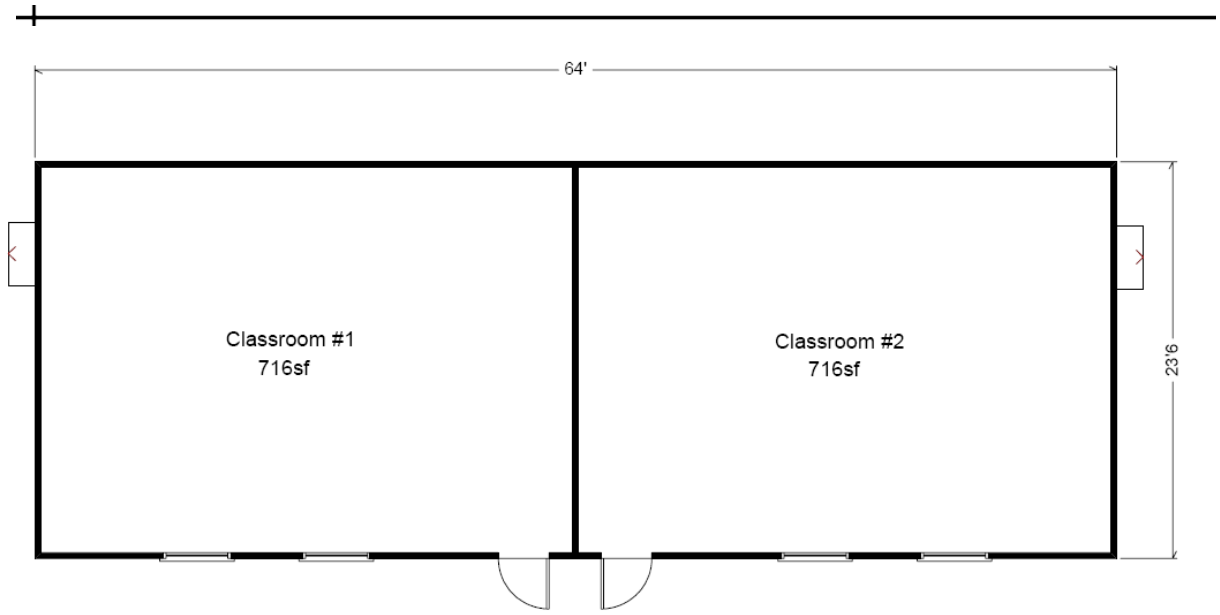
W. Hitch/Tires/Axles: Hitches will be removed and stored under building while tires and axles are to remain on the modules. Tires and axles will be removed only if necessary to complete the building installation due to site constraints and will also be placed under the modules.

1.5 Furniture, Fixtures, and Equipment (FF&E)

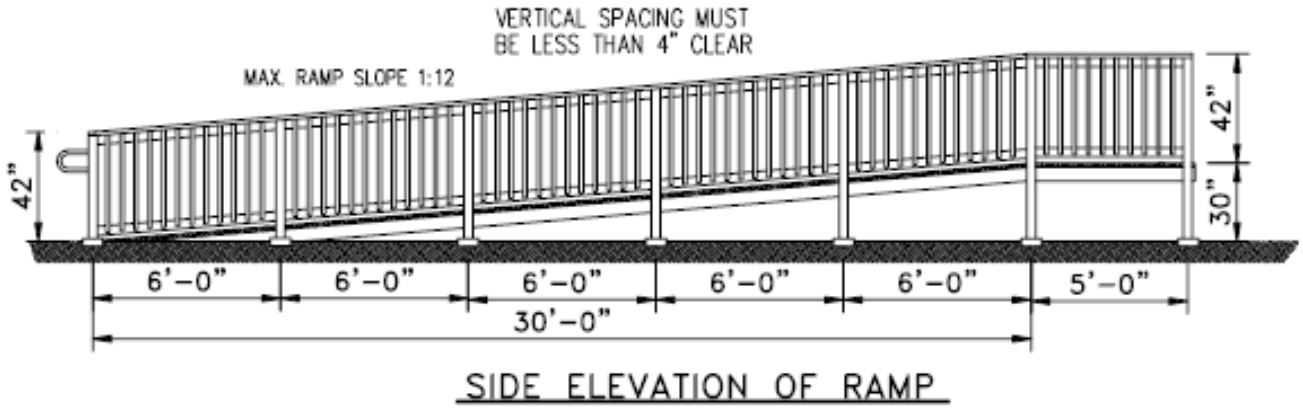
A. The Contractor shall furnish and set in place all FF&E items necessary for a functional classroom. The furniture may be provided by FBISD, but will be the full responsibility of the contractor to move to site and back to origin. These items should include, at a minimum: student desks and chairs, teacher desk and chair, one 4-drawer vertical file cabinet, one portable teacher storage cabinet for coat and other storage, student storage cubbies/shelving and coat hooks, and computer station desks and chairs.

1.6 Drawings

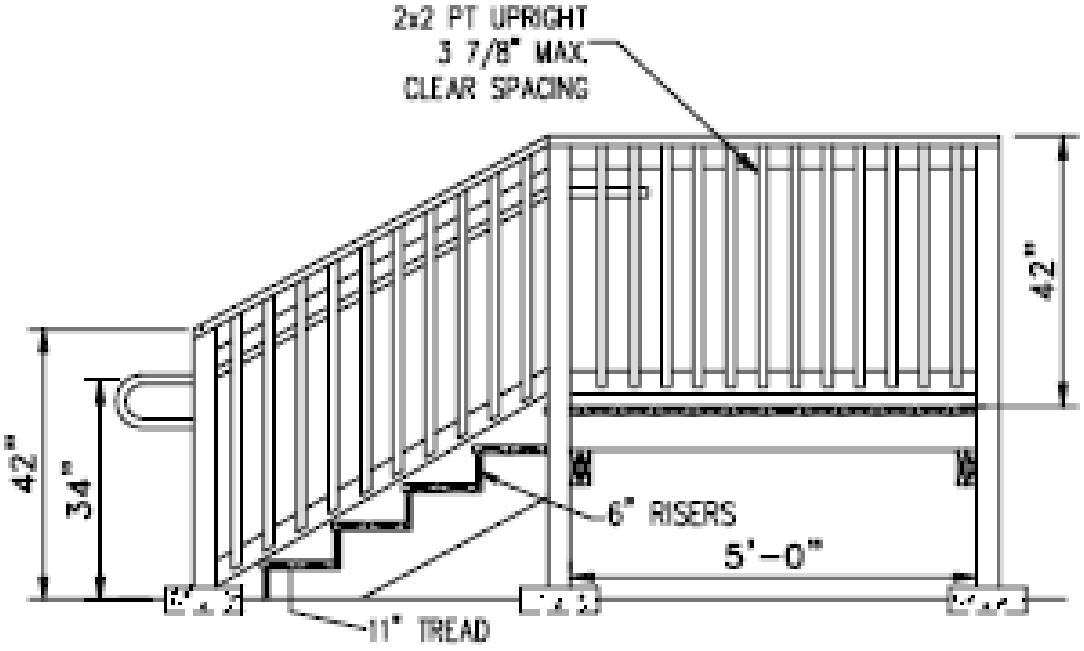
A. The following is a typical floor plan design guideline drawing:



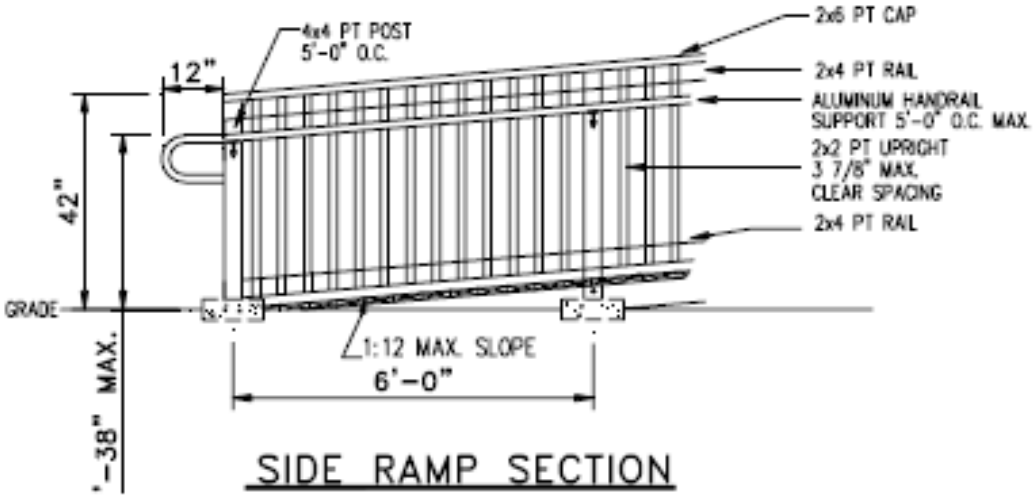
A. The following design guideline drawings are to be used for ramps/walkways:



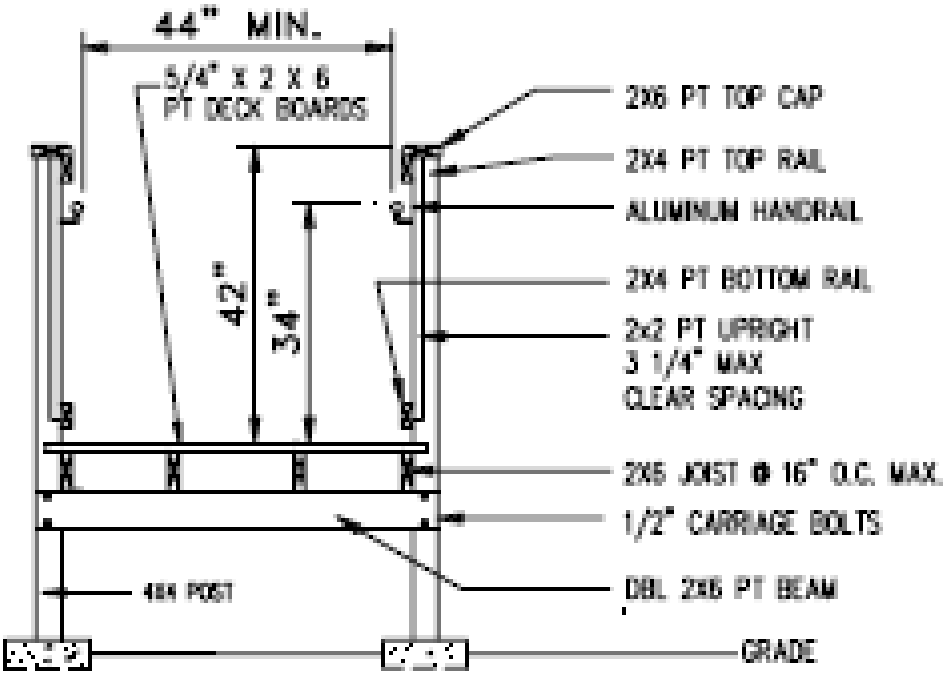
SIDE ELEVATION OF RAMP



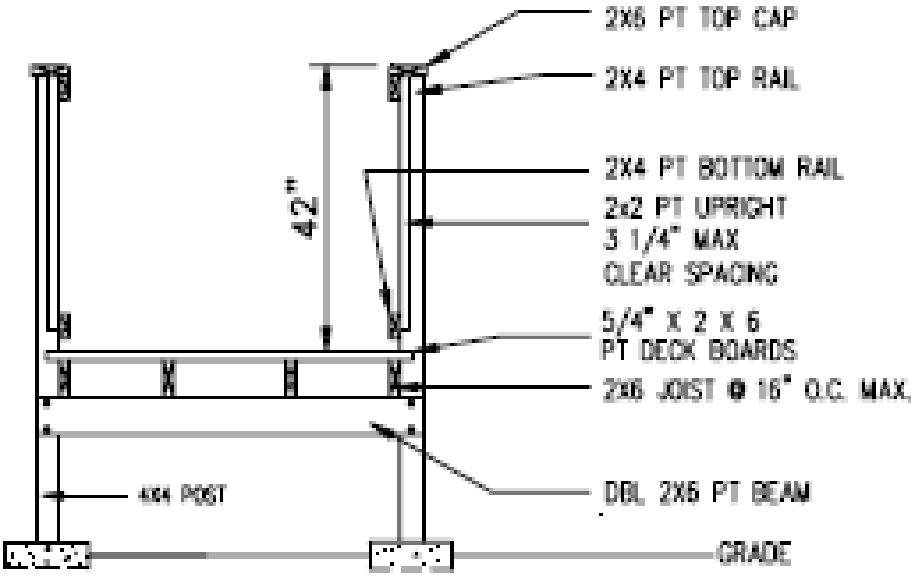
SIDE ELEVATION OF STEP



SIDE RAMP SECTION



STEP/RAMP SECTION



ELEV. WALKWAY SEC 'A'

End of Section 01 52 14

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for signs, signals, control devices, traffic barriers, flares, lights and traffic signals; construction parking control, designated haul routes, and bridging of trenches and excavations.
B. Qualifications and requirements for use of flagmen.

1.2 MEASUREMENT AND PAYMENT

A. Unit Price Contracts.
   1. Traffic control and regulation. Payment will be based on Contractor's Schedule of Values for traffic control and regulation. Include preparation and submittal of traffic control plan if different than shown on Drawings, and provision of traffic control devices, equipment, and personnel necessary to protect the Work and public.
   2. Flagmen. Payments will be based on Contractor's Schedule of Values for flagmen.
   3. Refer to Division 1 for unit price procedures.
B. Stipulated Price Contracts. Include payment for work under this section in the total Stipulated Price.

1.3 REFERENCES

A. Texas Manual on Uniform Traffic Control Devices (TMUTCD).
B. Article 4413 (29bb), commonly referred to as Private Investigators and Private Security Agencies Act, and Article 2.12, Texas Code of Criminal Procedure.
C. Areas having jurisdiction feedback and comments related to traffic control.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.
B. Traffic control plan:
   1. If using traffic control plan contained in the Contract without modification no additional information required.
   2. If using a different traffic control plan, submit the plan for approval to the local Governing Jurisdiction, Owner and Engineer. The plan must conform to TMUTCD requirements and be sealed by a Registered Texas Professional Engineer. The Contractor is responsible for obtaining approval from the Governing entity if using an alternate plan.
C. Submit copies of approved lane closure permits issued by all governmental authorities via owners designated software.
D. Submit Schedules of Values for traffic control plan and flagmen within ~~30~~ 10 days following Notice to Proceed.
E. Submit records verifying qualifications of Uniformed Peace Officers and Certified Flagmen proposed for use on the Work via transmittal in owners designated software.

1.5 SUSTAINABLE DESIGN (LEED) REQUIREMENTS

A. New Schools shall be LEED Certified Projects.

1.6 FLAGMEN

A. Use Uniformed Peace Officers and Certified Flagmen to control movement of vehicular and pedestrian traffic when construction operations encroach on public traffic lanes.

B. Uniformed Peace Officer: Individual employed full-time as a peace officer who receives separate compensation as a privately employed flagman. Private employment may be an employee-employer relationship or on an individual basis. Flagman may not be in the employ of another peace officer nor be a reserve peace officer.

1. Uniformed Peace Officers may be:
   a. Sheriffs and their deputies;
   b. Constables and deputy constables;
   c. Marshals or police officers of an incorporated city, town or village; or
   d. As otherwise provided by Article 2.12, Code of Criminal Procedure.
2. The Uniformed Peace Officer must be a full-time peace officer, must work a minimum average of 32 paid hours per week, and must be paid a rate not less than the prevailing minimum hourly wage rate set by the federal Wage and Hour Act. The individual must be entitled to vacation, holidays, and insurance and retirement benefits.

C. Certified Flagman: Individual who receives compensation as a flagman and meets the following qualifications:

1. Formally trained and certified in traffic control procedures by the City's E. B. Cape Center.
2. Speaks English. Ability to speak Spanish is desirable but not required.
3. Paid for flagman duty at an hourly rate not less than the wage rate set for Rough Carpenter under the City of Houston's Wage Scale for Engineering Construction.

D. Certified Flagmen must wear a distinctive uniform, bright-colored vest, and be equipped with appropriate flagging and communication devices while at the Work site. They must also have in their possession while on duty, a proof of training identification card issued by the appropriate training institute.

PART 2 PRODUCTS

2.1 SIGNS, SIGNALS, AND DEVICES

A. Comply with TMUTCD requirements.

B. Traffic cones and drums, flares and lights: Conform to local jurisdictions' requirements.

2.2 PORTABLE LOW PROFILE CONCRETE BARRIERS

A. The low profile concrete barrier is a patented design. Information concerning this barrier may be obtained from Texas Transportation Institute, Texas A&M University System, College Station, Texas 77843-3135, (409) 845-1712.

PART 3 EXECUTIO0N

3.1 PUBLIC ROADS

A. Submit requests forms for lane closure and sidewalk closure to the appropriate governmental authority prior to need for blocking vehicular lanes or sidewalks. Do not block lanes or sidewalks without approved permits.
B. Follow laws and regulations of governing jurisdictions when using public roads. Pay for and obtain permits from jurisdiction before impeding traffic or closing lanes. Coordinate activities with Owner's Representative.
C. Give Owner's Representative one-week notice before implementing approved traffic control phases. Inform local businesses of impending traffic control activities.
D. Notify police department, fire department, METRO, and local schools, churches, and businesses in writing a minimum of five business days prior to beginning work.
E. Maintain 10-foot-wide all-weather lanes adjacent to the Work for emergency vehicle use. Keep all-weather lanes free of construction equipment and debris.
F. Do not obstruct normal flow of traffic from 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. on designated major arterials or as directed by Owner's Representative.
G. Maintain local driveway access to residential and commercial properties adjacent to work areas at all times. Use all-weather materials approved by architect or Owner's Representative to maintain temporary driveway access to commercial and residential driveways.
H. Keep streets entering and leaving job site free of excavated material, debris, and foreign material resulting from construction operations in compliance with applicable ordinances.
I. Remove or cover existing signage and striping that conflict with construction activities or that may cause driver confusion.
J. Provide safe access for pedestrians along major cross streets.
K. Alternate closures of cross streets so that two adjacent cross streets are not closed simultaneously.
L. Do not close more than two consecutive esplanade openings at a time without prior approval from Owner's Representative.

3.2 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and the Owner's operations.
B. Monitor and control parking of construction personnel's vehicles in existing facilities. Provide a layout plan designating construction personnel parking for approval by owner's representative using submittal procedures in 01 33 00 in kahua. Maintain vehicular access to and through parking areas.
C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.3 FLARES AND LIGHTS

A. Provide lights or reflectors during hours of low visibility to delineate traffic lanes and to guide traffic.

3.4 HAUL ROUTES

A. Utilize haul routes designated by authorities or shown on Drawings for construction traffic.
B. Confine construction traffic to designated haul routes.
C. Provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.

3.5 TRAFFIC SIGNS AND SIGNALS

A. Construct necessary traffic control devices for temporary signals required to complete the Work including loop detectors, traffic signal conduits, traffic signal wiring and crosswalk signals. Notify the governmental agency having jurisdiction in advance of need for control boxes and switchgear. The Contractor will pay for all necessary service, programming or adjustments, to signal boxes and switchgear if required during construction.
B. Install and operate traffic control signals to direct and maintain orderly traffic flow in areas under Contractor's control affected by Contractor's operations. Post notices, signs and traffic controls before moving into next phase of traffic control.
C. Relocate traffic signs and signals as the Work progresses to maintain effective traffic control.
D. Unless otherwise approved by Owner’s Representative, provide driveway signs with name of business that can be accessed from each crossover. Use two signs for each crossover.
E. Replace existing traffic control devices in Project area.
F. Owner’s Representative may direct Contractor to make minor adjustments to traffic control signage to eliminate driver confusion and maintain orderly traffic flow during construction at no additional cost to the Owner.

3.6 BRIDGING TRENCHES AND EXCAVATIONS

A. When necessary, construct bridges over trenches and excavation to permit an unobstructed flow of traffic across construction areas and major drives. Use steel plates of sufficient thickness to support H-20 loading and install to operate with minimum noise. All bridging provided for vehicular or equipment traffic will be approved by an engineer at contractor’s expense.
    1. Shore trench or excavation to support bridge and traffic.
    2. Secure bridging against displacement with adjustable cleats, angles, bolts or other devices when:
        a. Bridging is placed over existing bus routes,
        b. More than five percent of daily traffic is comprised of commercial or truck traffic,
        c. More than two separate plates are used for bridging, and
        d. When bridge is to be used for more than five consecutive days.
    3. Extend steel plates used for bridging a minimum of 1 foot beyond edges of trench or excavation. Use temporary paving materials such as premix to feather edges of plates to minimize wheel impact on secured bridging.

3.7 REMOVAL

A. Remove equipment and devices when no longer required.
B. Repair damage caused by installation.
C. Remove post settings to a depth of 2 feet.

3.8 TRAFFIC CONTROL, REGULATION AND DIRECTION

A. Use Flagmen to control, regulate and direct an even flow and movement of vehicular and pedestrian traffic, for periods of time as may be required to provide for public safety and convenience, where:
   1. Multi-lane vehicular traffic must be diverted into single lane vehicular traffic,
   2. Vehicular traffic must change lanes abruptly,
   3. Construction equipment must enter or cross vehicular traffic lanes and walks,
   4. Construction equipment may intermittently encroach on vehicular traffic lanes and unprotected walks and crosswalks,
   5. Traffic regulation is needed due to rerouting of vehicular traffic around the Work site, and
   6. Where construction activities might affect public safety and convenience.

B. Use of Flagmen to assist in the regulation of traffic flow and movement does not relieve Contractor of responsibility to take other means necessary to protect the Work and public.

3.9 INSTALLATION STANDARDS

A. Place temporary pavement for single lane closures, in accordance with TMUTCD.

B. Reinstall temporary and permanent pavement markings as approved by Owner's Representative. When weather conditions do not allow application according to manufacturer's requirements, alternate markings may be considered. Submit proposed alternate to AHJ's or Owner's Representative for approval prior to installation. No additional payment will be made for use of alternate markings.

3.10 MAINTENANCE OF EQUIPMENT AND MATERIAL

A. Submit name, address and telephone number of individual designated to be responsible for maintenance of traffic handling at construction site to Owner's Representative. Individual must be accessible at all times to immediately correct deficiencies in equipment and materials used to handle traffic including missing, damaged, or obscured signs, drums, barricades, or pavement markings.

B. Inspect signs, barricades, drums, lamps and temporary pavement markings daily to verify that they are visible, in good working order, and conform with traffic handling plans as approved by Owner's Representative. Immediately repair, clean, relocate, realign, or replace equipment or materials that are not in compliance.

C. Keep equipment and materials, signs and pavement markings, clean and free of dust, dirt, grime, oil, mud, or debris.

D. Obtain approval of Owner's Representative to reuse damaged or vandalized signs, drums, and barricades.

End of Section 01 55 26

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the work, whether temporary or permanent construction.

B. Related Sections.

1. Division 01 Section “Temporary Facilities and Controls” for temporary site fencing.
2. Division 03 Section “Site Clearing” for removing existing trees and shrubs.
3. Division 32 Section “Turf and Grasses” for turf (lawn) and meadow planting, hydro seeding and erosion control materials.
4. Division 32 Section “Plants” for border edgings.

1.3 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape at 6 inches (150 mm) above the ground for trees up to, and including, 4-inch (100 mm) size; and 12 inches (300 mm) above the ground for trees larger than 4-inch (100 mm) size.

B. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by a perimeter rigid fence established two (2) feet outside the tree dripline.

C. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1. Species and size of tree
2. Location on site plan. Include unique identifier for each.
3. Reason for pruning.
4. Description of pruning to be performed.
5. Description of maintenance following pruning.

C. Qualification Data: For qualified arborist and tree service firm.

D. Certification: For arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees are promptly and properly treated and repaired when damaged.

E. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

F. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or videotape.

2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.5 QUALITY ASSURANCE

A. Arborist Qualifications: Licensed arborist in jurisdiction where Project is located.
B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
C. Pre-installation Conference: Conduct conference at Project Site.
    1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
        a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
        b. Enforcing requirements for protection zones.
        c. Arborist's responsibilities
        d. Field Quality Control.

1.6 PROJECT CONDITIONS

A. The following practices are prohibited within protection zones:
    1. Storage of construction materials, debris, or excavated material
    2. Parking vehicles or equipment
    3. Foot traffic
    4. Erection of sheds or structures
    5. Impoundment of water
    6. Excavation or other digging unless otherwise indicated
    7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
B. Do not direct vehicle or equipment exhaust toward protection zones.
C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 PRODUCTS

2.1 Materials

A. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch (25 mm) in diameter, and free of weeds, roots, and toxic and other non-soil materials.
    1. Obtain topsoil only from well-drained sites where topsoil is 4 inches (100 mm) deep or more; do not obtain from bogs or marshes.
B. Topsoil: Complying with plant material notes as indicated on the drawings.

C. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
    1. Type: Pine Straw
    2. Color: Natural
    3. Application: Four (4) inches thick
D. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements:
    1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2 inch (50 mm) opening, 0.148 inch (3.76 mm) diameter wire chain-link fabric; with pipe posts, minimum 2 -318 inch (60 mm) OD line posts, and 2-718 inch (73 mm) OD comer and pull posts; with 1-518 inch (42 mm) OD top trails, with 0.177 inch (4.5 mm) diameter top tension wire and 0.177 inch (4.5 mm) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
    2. Height: 6 feet (1.8 m)
    3. Gates: Single swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 36 inches (914 mm)
E. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering and as follows:
    1. Size and Text: 18”x 24”
    2. Lettering: 3 inch (75 mm) high minimum, white characters on red background

PART 3 EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do no enter or cross protection zones.
B. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Tie a 1 inch (25 mm) blue-vinyl tape around each tree trunk at 54 inches (1,372 mm) above the ground.
B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused be dewatering operations.
C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated.
    1. Apply 4 inch (100 mm) average thickness or organic mulch. Do not place mulch within 6 inches (150 mm) of tree trunks.

2. In those instances where a proposed vehicular drive occurs within the tree protection zone, 1 inch thick plywood shall be placed a top 6 inch thick organic mulch within the affected area. This application shall remain in place until roots within drive area are pruned under supervision of a licensed arborist for installation of pavement.

3.3 TREE AND PLANT-PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
   1. Chain-Link Fencing: Install to comply with ASTMF567 and with manufacturer's written instructions.
   2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
   3. Access Gates: Install as described in Section 2.1.D.2; adjust to operate smoothly, easily and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption , or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 35 feet (10.5 m) on protection-zone fencing, but no fewer than four signs with each facing a different direction.

C. Maintain protection zones free of weeds and trash.

D. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

E. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
   1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
   2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division 31 Section "Earth Moving".

B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilizes. Cut roots as required for root pruning.
C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.
D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

A. Prune roots that are affected by temporary and permanent construction. Prune roots as directed and under the supervision of an arborist licensed in the jurisdiction of the construction activity.
B. Root pruning at Edge of Protection Zone: Pune roots as directed by arborist licensed in the jurisdiction of the construction activity.
C. Root Pruning within Protection Zone.

3.6 CROWN PRUNING

A. Prune branches that affected by temporary and permanent construction. Prune branches as directed by an arborist licensed in the jurisdiction of the construction activity.
    1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
    2. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
    3. Cut branches with sharp pruning instruments; do not break or chop.
    4. Do not apply pruning paint to wounds.
B. Chip removed branches and dispose of off-site.

3.7 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
    1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.
C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

D. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with topsoil. Place topsoil in a single un-compacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
   1. Submit details of proposed root cutting and tree and shrub repairs.
   2. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
   3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
   4. Perform repairs within 24 hours.
   5. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable or restoring to normal growth pattern. Consult with Architect if tree is a live oak.
   1. Proved new trees of same size and species as those being replaced for each tree that measures 4 inches (100 mm) or smaller in caliper size.
   2. Provide two (2) new trees of 6 inch (150 mm) caliper size for each tree being replaced that measure more than 4 inches (100 mm) in caliper size.
      a. Species: All trees.
   3. Plant and maintain new trees as specified in Division 32 Section "Plants".

3.10 DISPOSAL OR SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

End of Section 01 56 39

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Documentation to be prepared and signed by Contractor before conducting construction operations, in accordance with the Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit Number TXR 150000 (the Construction General Permit).

B. Implementation, maintenance, inspection, and termination of storm water pollution prevention control measures including, but not limited to, erosion and sediment controls, storm water management plans, waste collection and disposal, off-site vehicle tracking, and other appropriate practices shown on the Drawings or specified elsewhere in the Contract.

C. Review of the Storm Water Pollution Prevention Plan (SWP3) implementation in a meeting with the Owner's Representative prior to start of construction.

1.2 DEFINITIONS

A. Commencement of Construction Activities: The exposure of soil resulting from activities such as clearing, grading, and excavating.

B. Large Construction Activity: Project that:

1. Disturbs five acres or more, or
2. Disturbs less than five acres but is part of a larger common plan of development that will disturb five acres or more of land.

C. Small Construction Activity: Project that:

1. Disturbs one or more acres but less than five acres, or
2. Disturbs less than one acre but is part of a larger common plan of development that will ultimately disturb one or more acres but less than five acres.

D. TPDES Operator:

1. The person or persons who have day-to-day operational control of the construction activities which are necessary to ensure compliance with the SWP3 for the site or other Construction General Permit conditions.

1.3 SUSTAINABLE DESIGN (LEED) REQUIREMENTS

A. New Schools shall be LEED Certified Projects.

PART 2 PRODUCTS- Not Used

PART 3 EXECUTION

3.1 SITE SPECIFIC STORM WATER POLLUTION PREVENTION PLAN (SWP3)

A. Prepare a SWP3 following Part III of the Construction General Permit and the applicable local code. If conflicts exist between the Construction General Permit and the local regulations, the more stringent requirements will apply.

B. Update or revise the SWP3 as needed during the construction following Part III, Section E of the Construction General Permit.

C. Submit the SWP3 and any updates or revisions to the Owner's Representative for review and address comments prior to commencing, or continuing, construction activities.

3.2 NOTICE OF INTENT FOR LARGE CONSTRUCTION ACTIVITY

A. Fill out, sign, and date TCEQ Form 20022 Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity under the TPDES Construction General Permit (TXR 150000). Contractor shall provide NOI forms for both himself and Owner.
B. Transmit the signed Contractor's copy of TCEQ Form 20022, along with a check for the required fee, made out to Texas Commission on Environmental Quality.
C. Submission of the Notice of Intent form by the Contractor to TCEQ is required a minimum of fourteen days before Commencement of Construction Activities.

3.3 CONSTRUCTION SITE NOTICE FOR SMALL CONSTRUCTION ACTIVITY

A. Fill out, sign, and date the Construction Site Notice, Attachment 2 to TPDES General Permit TXR 150000, "Construction Site Notice."
B. Transmit the signed Construction Site Notice to the Engineer and Owner at least seven days prior to Commencement of Construction Activity.

3.4 CERTIFICATION REQUIREMENTS

A. Conduct inspections in accordance with TCEQ requirements. Ensure persons or firms responsible for maintenance and inspection of erosion and sediment control measures read, fill out, sign, and date the Erosion Control Contractor's Certification for Inspection and Maintenance. Use the EPA NPDES Construction Inspection Form.

3.5 RETENTION OF RECORDS

A. Keep a copy of this document and the SWP3 in a readily accessible location at the construction site from Commencement of Construction Activity until submission of the Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity under TPDES Construction General Permit (TXR 150000). Contractors with day-to-day operational control over SWP3 implementation shall have a copy of the SWP3 available at a central location, on-site, for the use of all operators and those identified as having responsibilities under the SWP3. Upon submission of the NOT, submit all required forms and a copy of the SWP3 with all revisions to the Owner's Representative.

3.6 REQUIRED NOTICES

A. Post the following notices from effective date of the SWP3 until date of final site stabilization as defined in the Construction General Permit:
    1. Post the TPDES permit number for Large Construction Activity or a signed TCEQ Construction Site Notice for Small Construction Activity. A signed copy of the Contractor's NOI must also be posted.
    2. Post notices near the main entrance of the construction site in a prominent place for public viewing. Post name and telephone number of Contractor's local contact person, brief project description and location of the SWP3.
        a. If posting near a main entrance is not feasible due to safety concerns, coordinate posting of notice with the Owner's Representative to conform to requirements of the Construction General Permit.
        b. If Project is a linear construction project (e.g.: road, utilities, etc.), post notice in a publicly accessible location near active

construction. Move notice as necessary.

3. Post a notice to equipment and vehicles operators, instructing them to stop, check, and clean tires of debris and mud before driving onto traffic lanes. Post at each stabilized construction exit area.
4. Post a notice of waste disposal procedures in a readily visible location on site.

3.7 ON-SITE WASTE MATERIAL STORAGE

A. On-site waste material storage shall be self-contained and shall satisfy appropriate local, state, and federal rules and regulations.
B. Prepare list of waste material to be stored on-site. Update list as necessary to include up to- date information. Keep a copy of updated list with the SWP3.
C. Prepare description of controls to reduce pollutants generated from on-site storage. Include storage practices necessary to minimize exposure of materials to storm water, and spill prevention and response measures consistent with best management practices. Keep a copy of the description with the SWP3.

3.8 NOTICE OF TERMINATION

A. Submit a NOT to TCEQ and the Engineer within 30 days after:
    1. Final stabilization has been achieved on all portions of the site that are the responsibility of the Contractor; or
    2. Another operator has assumed control over all areas of the site that have not been stabilized; and
    3. All silt fences and other temporary erosion controls have either been removed, scheduled to be removed as defined in the SWP3, or transferred to a new operator if the new operator has sought permit coverage.

End of Section 01 57 10

SECTION 01 57 13 – EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section pertains to the implementation, maintenance inspection, and termination of storm water pollution prevention control measures including, but not limited to, erosion and sediment controls, storm water management plans, waste collection and disposal, off-site vehicle tracking, and other appropriate practices shown on the Storm Water Pollution Prevention Plan (SWPP PLAN), on the plans or required by the Texas Pollutant Discharge Elimination System (TPDES) General Permit TXR150000.

B. The Contractor is responsible for meeting all local, state and federal regulations regarding erosion control including the applicable provisions of the National Pollution Discharge Elimination System, Phase II, regulations from the Clean Water Act.

1.01 DEFINITIONS

A. Commencement of Construction Activities: The exposure of soil resulting from activities such as clearing, grading, and excavation activities, as well as other construction related activities (e.g., stock piling of fill material, demolition).

B. Large Construction Activity: Project that:
   1. Disturbs five acres or more, or
   2. Disturbs less than five acres but is part of a larger common plan of development that will disturb five acres or more of land.

C. Small Construction Activity: Project that:
   1. Disturbs one or more acres but less than five acres, or
   2. Disturbs less than one acre but is part of a larger common plan of development that will ultimately disturb one or more acres but less than five acres.

D. TPDES Operator:
   1. Operator - The person or persons associated with a large or small construction activity that is either a primary or secondary as defined below:
      a. Primary Operator – the person or persons associated with a large or small construction activity that meets either of the following two criteria:
         i. The persons have operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or
         ii. The person or persons have day-to-day operational control of those activities at a construction site that are necessary to ensure compliance with a storm water pollution prevention plan (SWPP PLAN) for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPP PLAN or comply with other permit conditions).
      b. Secondary Operator – The person whose operational control is limited to the employment of other operators or to the ability to approve or disapprove changes to plans and specifications. A secondary operator is also defined as a primary operator if there are no other operators at the construction site.

E. Best Management Practices (BMP's): Physical facilities schedules of activities, prohibition of practices, maintenance procedures, and other management practices, when properly designed, installed, and maintained, will be effective to prevent or reduce the discharge of pollution associated with construction activities. BMP's also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

F. Block Sodding: Sodding for erosion control and for final stabilization shall consist of providing and planting Bermuda grass, San Augustine grass, or other acceptable sod along or across such areas as are designated on the drawings and in accordance with the specification requirements herein outlined.

G. Hydromulch Seeding: Seeding, followed by the application of a mulch erosion control blanket shall consist of preparing the ground, sowing of seeds, application of a fertilizer, and stabilization with mulch consisting of a biodegradable fiber along and across such areas as are designated on the plans and in accordance with these specifications

H. Silt Fence: The reinforced filter fabric barrier consists of geotextile fabric supported by a net reinforced fence stretched across and attached to supporting posts or frame and entrenched. Work shall be performed during construction operations and prior to final stabilization to control erosion and sedimentation as designated on the plans and in accordance with these specifications.

I. Inlet Protection Barriers: The inlet protection barrier consists of a geotextile fabric (filter fabric) supported by a net reinforced fence structure and constructed around a storm drain inlet, catch basin, or culvert. An alternative design of the inlet protection barrier, as approved by the Engineer, consists of fiber rolls placed around a frame, staked in place (or weighted down with clean gravel bags), and constructed around a storm drain inlet, catch basin or culvert. This work shall be performed during construction operations and prior to final stabilization to control erosion and sedimentation. As designated on the plans and in accordance with these specifications.

J. Sediment Basins: A sediment basin is a temporary basin or dam constructed across a waterway or excavated location to intercept sediment-laden runoff and to trap and retain the sediment. A sediment basin is usually installed at points of discharge from drainage areas greater than 5 acres. Work shall be performed during construction operations and prior to final stabilization to control erosion and sedimentation as designated on the plans and in accordance with these specifications.

K. Stabilized Construction Access: This work shall consist of the installation of temporary erosion protection and sediment control stabilized construction access - type I, rock, utilized during construction operations and prior to final stabilization, in accordance with these specifications and construction drawings.

L. Rock Filter Dams: Rock filter dams are temporary berms constructed of stone to intercept and slow storm water runoff to retain sediment on the construction site.

1. Depending upon the type of rock filter dam specified in the construction plans as Type 1, 2, 3, or 4, the aggregate fill may be unwrapped, wrapped in twisted hexagonal wire mesh, or confined in a gabion wire basket. Applications of Rock Filter Dams are as follows:
    a. Type 1 dams may be used at toe of slopes, around inlets, in small ditches, and at dike or swale outlets. Type 1 dams are recommended for erosion and sediment control from a drainage area of 5 acres or less.
    b. Type 2 dams may be used in ditches and at dike or swale outlets.
    c. Type 3 dams may be used in stream flow.
    d. Type 4 sack gabions may be used in ditches and smaller channels to form an erosion and sediment control dam

1.02 REGULATORY REQUIREMENTS

A. Contractor shall comply with all current, applicable codes and regulations.

B. Contractor shall comply with all Standard Specifications and Details of Authorities having Jurisdiction for work in the right-of-way or easements.

C. Prior to commencement of work, the Contractor shall be responsible for obtaining, at the contractors own expense, all construction permits necessary to complete the project according to the plans and specifications.

1.03 SUBMITTALS

A. Submit a copy of the Storm Water Pollution Prevention Plan (SWPP Plan).

B. Submit a copy of the Notice of Intent (NOI).

C. Submit a copy of the Notice of Termination (NOT).

D. Submit manufacturer's literature for product specifications and installation instructions.

E. Submit manufacturer's catalog sheets and other product data on geotextile or filter fabrics, outlet pipe, perforated riser and connectors.

F. Submit proposed methods, equipment, materials, and sequence of operations for storm-water pollution prevention structures.

G. Submit shop drawings for inlet baskets.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

PART 2 – PRODUCTS

2.01 SUSTAINABLE MATERIALS

A. Contractor shall strive to utilize sustainable materials, which include rapidly renewable materials, regional materials, regionally manufactured materials, regionally extracted materials, recycled contents.

2.02 GRASS

A. Materials for erosion control seeding shall conform to the requirements of 32 92 13 – Hydromulch Seeding.

B. Materials for erosion control seeding shall conform to the requirements of 32 92 00 – Turf and Grasses.

2.03 BANK SAND BACKFILL

A. Durable bank run sand classified as SP, SW, or SM by Unified Soil Classification System (ASTM D 2487) meeting following requirements:

1. Less than 15 percent passing number 200 sieve when tested in accordance with ASTM D 1140. Amount of clay lumps or balls may not exceed 2 percent.
2. Material passing number 40 sieve shall meet the following requirements when tested in accordance with ASTM D 4318: PI not exceeding 7.

2.04 WATER

A. Water used for mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter or other substances injurious to the finished product.

B. Water sources other than the local municipal domestic water supply must be approved by the Owner's Representative.

C. If onsite reclaimed water sources are used, tanks and appurtenances must be clearly marked with the words "non-potable" water.

2.05 STABILIZED CONSTRUCTION ACCESS

A. Provide crushed aggregate for long- and short-term construction exits. Furnish aggregates that are clean, hard, durable, and free from adherent coatings such as salt, alkali, dirt, clay, loam, shale, soft or flaky

materials, and organic and injurious matter. Use 4 to 8-inches aggregate for Type 1. Use 2 to 4-inches aggregate for Type 3.

2.06 SILT FENCE

A. Woven or nonwoven geotextile filter fabric made of polypropylene, polyethylene, ethylene, or polyamide material, in continuous rolls of longest practical length.

B. Grab Strength: 100 psi in any principal direction (ASTM D-4632), CBR puncture strength >200 psi (ASTM D-3786), and equivalent opening size between 50 and 140.

C. Furnish ultraviolet inhibitors and stabilizers for minimum 6 months of expected usable construction life at temperature range of 0 degrees F to 120 degrees F.

D. Provide net reinforcement of at least 12.5 gauge (SWG) galvanized welded wire mesh, with a maximum opening size of 2 × 4 in., at least 24 in. wide, unless otherwise shown on the plans.

E. TenCate Geosynthetics, Contech Engineered Solutions, or equivalent.

2.07 INLET PROTECTION BARRIERS

A. Geotextile shall be per the requirements of paragraph 2.6 of this section.

B. Provide net reinforcement of at least 12.5 gauge (SWG) galvanized welded wire mesh, with a maximum opening size of 2 × 4 in., at least 24 in. wide, unless otherwise shown on the plans.

C. Barrier Stakes: Nominal 2 by 2 inch moisture-resistant treated wood or steel posts (min. of 1.25 lbs. per linear foot and Brinell Hardness greater than 140) with safety caps on top; length as required for minimum 12 inch bury and full height of filter fabric.

2.08 DROP INLET BASKET

A. Provide steel frame members in accordance with ASTM A36.

B. Construct top frame of basket with two short sides of 2 inch by 2 inch and single long side of 1 inch by 1 inch, 1/8 inch angle iron. Construct basket hangers of 2 inch by 1/4 inch iron bars. Construct bottom frame of 1 inch by 1/4 inch iron bar or 1/4 inch plate with center 3 inches removed. Use minimum 1/4 inch diameter iron rods or equivalent for sides of inlet basket.

C. Weld aminimum of 14 rods in place between top frame/basket hanger and bottom frame. Exact dimensions for top frame and insert basket will be determined based on dimensions of type of inlet being protected.

2.09 SANDBAGS

A. Provide woven material made of polypropylene, polyethylene, or polyamide material.

1. Minimum unit weight of four ounces per square yard.
2. Minimum grab strength of 100 lbs in any principal direction (ASTM D4632).
3. Mullen burst strength exceeding 300 lbs (ASTM D4833).
4. Ultraviolet stability exceeding 70 percent. After 500 hours of exposure (ASTM 4355).
5. Size: Length: 18 to 24 inches. Width: 12 to 18 inches. Thickness: 6 to 8 inches. Weight: Approximately 40 to 50 pounds not to exceed 75 pounds.

2.10 BAGGED GRAVEL BARRIER

A. Provide a bagged gravel barrier.

1. Minimum unit weight of four ounces per square yard.
2. Minimum grab strength of 100 lbs in any principal direction (ASTM D4632).

3. Mullen burst strength exceeding 300 lbs (ASTM D4833).
4. Ultraviolet stability exceeding 70 percent. After 500 hours of exposure (ASTM 4355).
5. Size: Length:18 to 24 inches. Width: 12 to 18 inches. Thickness: 6 to 8 inches. Weight: Approximately 40 to 50 pounds not to exceed 75 pounds.

2.11 ROCK FILTER DAM

A. Materials. Geotextile fabric shall consist of a woven monofilament or spunbond nonwoven fibers consisting of long-chain synthetic polymers composed of at least 95 percent by weight of polyolefins. Geotextile fabric shall equal or exceed the following average roll values or as directed by the Engineer:

1. Minimum average roll value.
   a. Elongation ³ 50 percent.
   b. Grab Strength – 200 pounds.
   c. Puncture Strength – 75 pounds.
   d. UV Stability (retained strength) – 50 percent after 500 hours of exposure.
2. Maximum average roll value.
   a. Apparent Opening Size (AOS) – 0.6 mm/#30 US sieve.

B. Geotextile fabric shall be resistant to commonly encountered soil chemicals, mildew, rot, insects, and deterioration resulting from exposure to sunlight or heat. Geotextile fabric shall provide an expected useable life comparable to the anticipated construction period.

C. Aggregate for the rock filter dams shall consist of crushed stone. Aggregate particles shall be composed of clean, hard, durable materials free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials or organic and injurious matter. Aggregate shall be cubic or rounded form, not elongated, flat, shapes. Spalls, fragments, and chips shall not exceed 5 percent by weight. Crushed concrete may be substituted for the crushed stone. Aggregate size shall depend upon the type of rock filter dam specified in the construction plans. Aggregate size based on type of rock filter dam is as follows:

1. Type 1:
   a. Used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets for a drainage area of 5 acres or less.
   b. 3 inches to 5 inches, open-graded.
2. Type 2:
   a. Used in ditches and at dike or swale outlets.
   b. 3 inches to 5 inches, open-graded.
3. Type 3:
   a. Used in stream flow.
   b. 4 inches to 8 inches, open-graded.
4. Type 4:
   a. Sack gabions may be used in ditches and smaller channels to form an erosion and sediment control dam.
   b. 3 inches to 5 inches, open-graded.

D. Mesh is required for reinforced type rock filter dams. Mesh shall be 20 gauge galvanized double twisted hexagonal wire mesh with 1-inch diameter hexagonal openings. Mesh wire shall be zinc coated prior to being double twisted. Reinforcing spiral binders, lacing wire, and stiffeners shall be made of wire having the same coating material and same wire size as the wire mesh. Gabion wire baskets shall equal or exceed the requirements of the wire mesh.

PART 3 – EXECUTION

3.01 PREPERATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction. Restore damaged improvements to their original condition, as acceptable to Owner.

C. Plan Work to minimize the time areas are to be exposed without vegetative cover.

D. Prepare a SWPP Plan following the requirements of the Construction General Permit and the requirements of the local MS4. If conflicts exist between the Construction General Permit and the requirements of the MS4, the more stringent requirements will apply.

1. Update or revise the SWPPP as needed during the construction following the requirements of the Construction General Permit.
2. Submit the SWPPP and any updates or revisions to the Owner's Representative for review and address comments prior to commencing, or continuing, construction activities.

E. Notice of Intent for Large Construction Activity
1. Fill out, sign, and date TCEQ Notice of Intent (NOI) form for Storm Water Discharges Associated with Construction Activity under the TPDES Construction General Permit (TXR 150000) for the Contractor and Owner.
2. Transmit the signed Contractor's and Owner's copy of the NOI, along the required fees to the TCEQ. Provide a copy of the documents to the Owner's Representative.
3. Submission of the Notice of Intent form by the Contractor and Owner is required a minimum of seven days before Commencement of Construction Activities.

F. Construction Site Notice for Small Construction Activity
1. Fill out, sign, and date the Construction Site Notice, contained in the TPDES General Permit TXR 150000.
2. Transmit the signed Construction Site Notice to Owner's Representative at least seven days prior to Commencement of Construction Activity.

G. Certification Requirements
1. Complete the Large Construction Site "Primary Operator" Notice.
2. Contractor shall complete the Large Construction Site "Secondary Operator" Notice and provide it to the Owner and Subcontractor's for signature.
3. Submit properly completed certification forms to the Owner's Representative for review before beginning construction operations.
4. Conduct inspections in accordance with TCEQ requirements. Use the EPA NPDES Construction Inspection Form to record maintenance inspections and repairs.

H. Post the following notices from effective date of the SWPP Plan until date of final site stabilization as defined in the Construction General Permit:
1. Post the TPDES permit number for Large Construction Activity, with a signed TCEQ Construction Site Notice for large or Small Construction Activity. Signed copies of the Contractor's and Owner's NOI, as applicable, must also be posted.
2. Post notices near the main entrance of the construction site in a prominent place where it is safely and readily available for viewing by General Public, Local, State, and Federal Authorities. Post name and telephone number of Contractor's local contact person, brief project description and location of the SWPP PLAN.
    a. If posting near a main entrance is not feasible due to safety concerns, coordinate posting of notice with The Owner's Representative to conform to requirements of the Construction General Permit.
    b. If Project is a linear construction project (e.g.: road, utilities, etc.), post notice in a publicly accessible location near active construction. Move notice as necessary.
3. Post a notice to equipment and vehicles operators, instructing them to stop, check, and clean tires of debris and mud before driving onto traffic lanes. Post at each stabilized construction access area.
4. Post a notice of waste disposal procedures in a readily visible location on site.

I. Keep a copy of this document and the SWPP Plan in a readily accessible location at the construction site from Commencement of Construction Activity until submission of the Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity under TPDES Construction General Permit (TXR 150000). Contractors with day-to-day operational control over SWPP Plan implementation shall have a copy of the SWPP PLAN available at a central location, on-site, for the use of all operators and those identified as having responsibilities under the SWPP Plan. Upon submission of the NOT, submit all required forms and a copy of the SWPP Plan with all revisions to the Owner's Representative.

3.02 GENERAL

A. Use all means necessary to control dust on or near the site resulting from the performance of the Work. Thoroughly moisten all surfaces to prevent dust being a nuisance to the public, adjacent uses, and concurrent work on site. Moisture level during compaction operations shall not exceed that amount as specified by Geotechnical Engineer.

B. Install erosion control systems at the site's boundary at locations where stormwater runoff will leave the site prior to starting any clearing, stripping, or earthwork operations.

C. Properly dispose of solid waste, paints, solvents, cleaning compounds, etc.

D. Store construction materials in designated areas away from drainageways and low areas.

E. Construct containment berms and utilize drip pans at fuel and liquid storage tanks and containers.

3.03 INSTALLATION OF EROSION CONTROL DEVICES

A. Install erosion control devices to protect adjacent and downstream properties from damage and pollution resulting from erosion caused by the work of this Contract. Implement erosion control measures indicated on drawings and additional erosion control measures necessary to prevent damage to adjacent and downstream properties.

B. Install silt fence located along perimeter of site or grading limits immediately following site clearing operations specified under Division 31 Section 31 11 00 – Clearing and Grubbing.

1. Install silt fence fabric from a continuous roll for the length of the silt fence whenever possible to minimize the number of joints. Create joints in fabric by securely fastening fabric at the support post with overlap extending to the next post.
2. Drive support post into ground not less than 18 inches.
3. Excavate a 4-inch wide by 4-inch deep trench on up-slope side of silt fence.
   a. Line trench with silt fence fabric material.
   b. Backfill trench with soil or gravel.

C. Install inlet protection barriers at all inlets.

D. Stabilized Construction Access

1. Provide stabilized construction roads and access at construction, staging, parking, storage, and disposal areas to keep street clean of mud carried by construction vehicles and equipment. Construct erosion and sediment controls in accordance with Drawings, Specification and any requirements of the authority having jurisdiction.
2. Place the exit over a foundation course, if necessary. Grade the foundation course or compacted subgrade to direct runoff from the construction exits to a sediment trap.
3. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as required.
4. Construct to a depth of at least 8 in. using crushed aggregate as shown on the plans or as directed.

3.04 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

B. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

C. Stockpile Topsoil may not exceed 6 feet in height.

3.05 FIELD QUALITY CONTROL

A. Testing shall be the responsibility of the Owner and costs of initial testing shall be paid by Owner. Cost of all subsequent testing necessary due to non-compliance with specifications shall be paid by Contractor.

B. Density Test:

1. Frequency and scope of testing shall be established by Geotechnical Engineer, and as required by local jurisdictional authority. If Geotechnical Engineer has not established a frequency of testing in the Geotechnical Report, testing shall be at every 100 linear foot of trench at a minimum of one per lift and a minimum of one per day.
2. Tests shall be performed in accordance with the referenced Standards.
3. Laboratory tests for moisture density relations shall be determined in accordance with ASTM D 1557. A minimum of one test shall be performed for each major soils type. In addition, sufficient number of retests or check points shall be performed to evaluate accuracy of maximum density values being used.
4. Field in-place density shall be determined in accordance with ASTM Test Methods D 1556 or D 2922, and the moisture-density relations shall be determined in accordance with ASTM Test Method D 1557.
5. Reopen improperly compacted trenches to depth directed, then refill and compact to the specified density at no additional cost to Owner

3.06 DRAINAGE CONTROLS

A. Provide all necessary temporary apparatus, pumps, curbs or ditches as required to divert or convey water from any source away from the Work. Do not allow water from any source to accumulate within or damage trenches.

END OF SECTION 31 22 13

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dewatering, depressurizing, draining, and maintaining trenches, shaft excavations, structural excavations and foundation beds in stable condition, and controlling ground water conditions for tunnel excavations.
B. Protecting work against surface runoff and rising floodwaters.
C. Trapping suspended sediment in the discharge form the surface and ground water control systems.

1.2 SUSTAINABLE DESIGN (LEED) REQUIREMENTS

A. New School Projects shall be LEED Certified Projects.

PART 2 MEASUREMENTS AND PAYMENT

2.1 UNIT PRICES

A. Measurement for control of ground water, if included in Bid Form, will be on either a lump sum basis or a linear foot basis for continuous installations of well points, eductor wells, or deep wells.
B. If not included in Bid Form, include the cost to control ground water in unit price for work requiring such controls.
C. No separate payment will be made for control of surface water. Include cost to control surface water in unit price for work requiring controls.
D. Follow Division 1 for unit price procedures.

2.2 REFERENCES

A. ASTM D 698 - Standard Test Methods for Laboratory Compaction of Soils Using Standard Effort (12,400 ft-lbf/ft3 (600kN-m/m3).
B. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).
C. Storm Water Management Handbook for Construction Activities prepared by Cities having jurisdiction authority.

2.3 DEFINITIONS

A. Ground water control system: system used to dewater and depressurize water-bearing soil layers.
    1. Dewatering: lowering the water table and intercepting seepage that would otherwise emerge from slopes or bottoms of excavations, or into tunnels and shafts; and disposing of removed water. Intent of dewatering is to increase stability of tunnel excavations and excavated slopes, prevent dislocation of material from slopes or bottoms of excavations, reduce lateral loads on sheeting and bracing, improve excavating and hauling characteristics of excavated material, prevent failure or heaving of bottom of excavations, and to provide suitable conditions for placement of backfill materials and construction of structures and other installations.
    2. Depressurization: includes reduction in piezometric pressure within strata not controlled by dewatering alone, necessary to prevent failure or heaving of excavation bottom or instability of tunnel excavations.
B. Excavation drainage: includes keeping excavations free of surface and seepage water.

C. Surface drainage: includes use of temporary drainage ditches and dikes and installation of temporary culverts and sump pumps with discharge lines necessary to protect Work from any source of surface water.
D. Monitoring facilities for ground water control system: includes piezometers, monitoring wells and flow meters for observing and recording flow rates.

2.4 PERFORMANCE REQUIREMENTS

A. Conduct subsurface investigations to identify groundwater conditions and to provide parameters for design, installation, and operation of groundwater control systems. Submit proposed method and spacing of readings for review prior to obtaining water level readings.
B. Design ground water control system, compatible with requirements of Federal Regulations 29 CFR Part 1926 and Division 2 to produce following results:
    1. Effectively reduce hydrostatic pressure affecting:
        a. Excavations.
        b. Tunnel excavation, face stability or seepage into tunnels.
    2. Develop substantially dry and stable subgrade for subsequent construction operations.
    3. Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities and other work.
    4. Prevent loss of fines, seepage, boils, quick condition, or softening of foundation strata.
    5. Maintain stability of sides and bottom of excavations.
C. Provide ground water control systems that include single-stage or multiple-stage well point systems, eductor and ejector-type systems, deep wells, or combinations of these equipment types.
D. Provide drainage of seepage water and surface water, as well as water from other sources entering excavation. Excavation drainage may include placement of drainage materials, crushed stone and filter fabric, together with sump pumping.
E. Provide ditches, berms, pumps and other methods necessary to divert and drain surface water from excavation and other work areas.
F. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.
G. Assume sole responsibility for ground water control systems and for any loss or damage resulting from partial or complete failure of protective measures and settlement or resultant damage caused by ground water control operations. Modify ground water control systems or operations if they cause or threaten to cause damage to new construction, existing site improvements, adjacent property, adjacent water wells, or potentially contaminated areas. Repair damage caused by ground water control systems or resulting from failure of system to protect property as required.
H. Install an adequate number of piezometers installed at proper locations and depths, necessary to provide meaningful observations of conditions affecting excavation, adjacent structures and water wells.
I. Install environmental monitoring wells at proper locations and depths necessary to provide adequate observations of hydrostatic conditions and

possible contaminant transport from contamination sources into work area or ground water control system.

2.5 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit Ground Water and Surface Water Control Plan for review by Owner's Representative prior to start of excavation work. Include the following:

1. Results of subsurface investigations and description of extent and characteristics of water bearing layers subject to ground water control.
2. Names of equipment Suppliers and installation Subcontractors.
3. Description of proposed ground water control systems indicating arrangement, location, depth and capacities of system components, installation details and criteria and operation and maintenance procedures.
4. Description of proposed monitoring facilities indicating depths and locations of piezometers and monitoring wells, monitoring installation details and criteria, type of equipment and instrumentation with pertinent data and characteristics.
5. Description of proposed filters including types, sizes, capacities and manufacturer's application recommendations.
6. Design calculations demonstrating adequacy of proposed systems for intended applications. Define potential area of influence of ground water control operation near contaminated areas.
7. Operating requirements, including piezometric control elevations for dewatering and depressurization.
8. Excavation drainage methods including typical drainage layers, sump pump application and other means.
9. Surface water control and drainage installations.
10. Proposed methods and locations for disposing of removed water.

C. Submit following records upon completion of initial installation:

1. Installation and development reports for well points, eductors, and deep wells.
2. Installation reports and baseline readings for piezometers and monitoring wells.
3. Baseline analytical test data of water from monitoring wells.
4. Initial flow rates.

D. Submit the following records weekly during control of ground and surface water operations:

1. Records of flow rates and piezometric elevations obtained during monitoring of dewatering and depressurization. Refer to Paragraph 3.02, Requirements for Eductor, Well Points, or Deep Wells.
2. Maintenance records for ground water control installations, piezometers and monitoring wells.

2.6 ENVIRONMENTAL REQUIREMENTS

A. Comply with requirements of agencies having jurisdiction.

B. Comply with Texas Commission on Environmental Quality regulations and Texas Water Well Drillers Association for development, drilling, and abandonment of wells used in dewatering system.
C. Obtain necessary permits from agencies with jurisdiction over use of groundwater and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Since review and permitting process may be lengthy, take early action to obtain required approvals.
D. Monitor ground water discharge for contamination while performing pumping in vicinity of potentially contaminated sites.

PART 3 PRODUCTS

3.1 EQUIPMENT AND MATERIALS

A. Select equipment and materials necessary to achieve desired results for dewatering. Selected equipment and materials are subject to review by Owner's Representative through submittals required in Paragraph 1.06, Submittals.
B. Use experienced contractors, regularly engaged in ground water control system design, installation, and operation, to furnish and install and operate eductors, well points, or deep wells, when needed.
C. Maintain equipment in good repair and operating condition.
D. Keep sufficient standby equipment and materials available to ensure continuous operation, where required.
E. Portable Sediment Tank System: Standard 55-gallon steel or plastic drums, free of hazardous material contamination.
    1. Shop or field fabricate tanks in series with main inlet pipe, inter-tank pipes and discharge pipes, using quantities sufficient to collect sediments from discharge water.

PART 4 EXECUTION

4.1 GROUND WATER CONTROL

A. Perform necessary subsurface investigation to identify water bearing layers, piezometric pressures and soil parameters for design and installation of ground water control systems. Perform pump tests, if necessary to determine draw down characteristics. Present results in the Ground Water and Surface Water Control Plan submittal.
B. Provide labor, material, equipment, techniques and methods to lower, control and handle ground water in manner compatible with construction methods and site conditions. Monitor effectiveness of installed system and its effect on adjacent property.
C. Install, operate, and maintain ground water control systems in accordance with the Ground Water and Surface Water Control Plan. Notify Owner's Representative in writing of changes made to accommodate field conditions and changes to Work. Provide revised drawings and calculations with notification.
D. Provide continuous system operation, including nights, weekends, and holidays. Arrange appropriate backup if electrical power is primary energy source for dewatering system.

E. Monitor operations to verify systems lower ground water piezometric levels at rate required to maintain dry excavation resulting in stable subgrade for subsequent construction operations.
F. Depressurize zones where hydrostatic pressures in confined water bearing layers exist below excavations to eliminate risk of uplift or other instability of excavation or installed works. Define allowable piezometric elevations in the Ground Water and Surface Water Control Plan.
G. Removal of ground water control installations.
    1. Remove pumping system components and piping when ground water control is no longer required.
    2. Remove piezometers, including piezometers installed during design phase investigations and left for Contractor's use, upon completion of testing, as required in accordance with Part 3 of applicable specification.
    3. Remove monitoring wells when directed by Owner's Representative.
    4. Grout abandoned well and piezometer holes. Fill piping that is not removed with cement-bentonite grout or cement-sand grout.
H. During backfilling, maintain water level a minimum of 5 feet below prevailing level of backfill. Do not allow the water level to cause uplift pressures in excess of 80 percent of downward pressure produced by weight of structure or backfill in place. Do not allow water levels to rise into cement-stabilized sand until at least 48 hour after placement.
I. Provide uniform pipe diameter for each pipe drain run constructed for dewatering. Remove pipe drains when no longer required. If pipe removal is impractical, grout connections at 50- foot intervals and fill pipe with cement-bentonite grout or cement-sand grout after removal from service.
J. The extent of ground water control for structures with permanent perforated underground drainage systems may be reduced, for units designed to withstand hydrostatic uplift pressure. Provide a means to drain affected portions of underground systems, including standby equipment. Maintain drainage systems during construction operations.
K. Remove systems upon completion of construction or when dewatering and control of surface or ground water is no longer required.
L. Compact backfill to not less than 95 percent of maximum dry density in accordance with ASTM D 698.
M. Foundation Slab: Maintain saturation line at least 3 feet below lowest elevations where concrete is to be placed. Drain foundations in areas where concrete is to be placed before placing reinforcing steel. Keep free from water for 3 days after concrete is placed.

4.2 REQUIREMENTS FOR EDUCTOR, WELL POINTS, OR DEEP WELLS

A. For above ground piping in ground water control system, include a 12-inch minimum length of clear, transparent piping between each eductor well or well point and discharge header to allow visual monitoring of discharge from each installation.
B. Install sufficient piezometers or monitoring wells to show that trench or shaft excavations in water bearing materials are pre-drained prior to excavation. Provide separate piezometers for monitoring of dewatering

and for monitoring of depressurization. Install piezometers and monitoring wells for tunneling as appropriate for selected method of work.

C. Install piezometers or monitoring wells at least one week in advance of the start of associated excavation.
D. Dewatering may be omitted for portions of under drains or other excavations, where auger borings and piezometers or monitoring wells show that soil is pre-drained by existing systems and that ground water control plan criteria are satisfied.
E. Replace installations that produce noticeable amounts of sediments after development.
F. Provide additional ground water control installations, or change method of control if, ground water control plan does not provide satisfactory results based on performance criteria defined by plan and by specifications. Submit revised plan according to Paragraph 1.6B.

4.3 SEDIMENT TRAPS

A. Install sediment tank as shown on approved plan if required.
B. Inspect daily and clean out tank when one-third of sediment tank is filled with sediment.

4.4 SEDIMENT SUMP PIT

A. Install sediment sump pits as shown on approved plan if required.
B. Construct standpipe by perforating 12 inch to 24-inch diameter corrugated metal or PVC pipe.
C. Extend standpipe 12 inches to 18 inches above lip of pit.
D. Convey discharge of water pumped from standpipe to sediment trapping device.
E. Fill sites of sump pits, compact to density of surrounding soil and stabilize surface when construction is complete.

4.5 EXCAVATION DRAINAGE

A. Use excavation drainage methods if well-drained conditions can be achieved. Excavation drainage may consist of layers of crushed stone and filter fabric, and sump pumping, in combination with sufficient ground water control wells to maintain stable excavation and backfill conditions.

4.6 MAINTENANCE AND OBSERVATION

A. Conduct daily maintenance and observation of piezometers or monitoring wells while ground water control installations or excavation drainage is operating at the site, or water is seeping into tunnels, and maintain systems in good operating condition.
B. Replace damaged and destroyed piezometers or monitoring wells with new piezometers or wells as necessary to meet observation schedules.
C. Cut off piezometers or monitoring wells in excavation areas where piping is exposed, only as necessary to perform observation as excavation proceeds. Continue to maintain and make specified observations.
D. Remove and grout piezometers inside or outside of excavation area when ground water control operations are complete. Remove and grout monitoring wells when directed by Owner's Representative.

4.7 MONITORING AND RECORDING

A. Monitor and record average flow rate of operation for each deep well, or for each wellpoint or eductor header used in dewatering system. Also,

monitor and record water level and ground water recovery. Record observations daily until steady conditions are achieved and twice weekly thereafter.

B. Observe and record elevation of water level daily as long as ground water control system is in operation, and weekly thereafter until Work is completed or piezometers or wells are removed, except when Owner's Representative determines more frequent monitoring and recording are required. Comply with Owner's Representative's direction for increased monitoring and recording and take measures necessary to ensure effective dewatering for intended purpose.

4.8 SURFACE WATER CONTROL

A. Intercept surface water and divert it away from excavations through use of dikes, ditches, curb walls, pipes, sumps or other approved means. Requirement includes temporary works required to protect adjoining properties from surface drainage caused by construction operations.

B. Divert surface water and seepage water into sumps and pump it into drainage channels or storm drains, when approved by agencies having jurisdiction. Provide settling basins when required by agencies.

End of Section 01 57 19

PART 1 GENERAL

1.1 SUMMARY

A. Construction procedures to promote adequate indoor air quality after construction.
B. Building flush-out after construction and before occupancy.
C. Testing indoor air quality before commencement of construction; existing building areas only.
D. Testing indoor air quality after completion of construction.
E. Testing air change effectiveness after completion of construction.

1.2 PROJECT GOALS

A. New Schools shall be LEED Certified Projects.
B. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
    1. Cleaning of ductwork is not contemplated under this Contract.
    2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
    3. Establish condition of existing ducts and equipment prior to start of alterations.
C. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
    1. Furnish products meeting the specifications.
    2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.
D. Ventilation: HVAC system has been designed to achieve the minimum requirements for ventilation specified in ASHRAE 62.1.

1.3 RELATED REQUIREMENTS

A. LEED Certification Procedures: LEED credits relating to indoor air quality.
B. Section 01 40 00 - Quality Requirements: Testing and inspection services.
C. Section 23 41 00 – Particulate Air Filtration.

1.4 REFERENCE STANDARDS

A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2012.
B. ASHRAE Std 62.1 - Ventilation For Acceptable Indoor Air Quality; 2013.
C. ASHRAE Std 129 - Measuring Air-Change Effectiveness; 1997 (Reaffirmed 2002).
D. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization; 2010.
E. SMACNA (OCC) - IAQ Guideline for Occupied Buildings Under Construction; 2007.

1.5 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
C. Particulates: Dust, dirt, and other airborne solid matter.
D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. LEED Submittals: Submit all submittals required in this section in accordance with procedures specified in Section 01 35 15.
C. NEW Construction or Additions - Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA IAQ Guidelines for Occupied Buildings Under Construction as a guide.
    1. Submit not less than 60 days before enclosure of building.
    2. Identify potential sources of odor and dust.
    3. Identify construction activities likely to produce odor or dust.
    4. Identify areas of project potentially affected, especially occupied areas.
    5. Evaluate potential problems by severity and describe methods of control.
    6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
    7. Describe cleaning and dust control procedures.
    8. Describe coordination with commissioning procedures.
D. NEW Construction or Additions- Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.
E. Duct and Terminal Unit Inspection Report.
F. Air Contaminant Test Plan: Identify:
    1. Testing agency qualifications.
    2. Locations and scheduling of air sampling.
    3. Test procedures, in detail.
    4. Test instruments and apparatus.
    5. Sampling methods.
G. Air Contaminant Test Reports: Show:
    1. Location where each sample was taken, and time.
    2. Test values for each air sample; average the values of each set of
    3. HVAC operating conditions.
    4. Certification of test equipment calibration.
    5. Other conditions or discrepancies that might have influenced results.
H. Ventilation Effectiveness Test Plan: Identify:
    1. Testing agency qualifications.
    2. Description of test spaces, including locations of air sampling.
    3. Test procedures, in detail; state whether tracer gas decay or step-up will be used.
    4. Test instruments and apparatus; identify tracer gas to be used.
    5. Sampling methods.

I. Ventilation Effectiveness Test Reports: Show:
   1. Include preliminary tests of instruments and apparatus and of test spaces.
   2. Calculation of ventilation effectiveness, E.
   3. Location where each sample was taken and time.
   4. Test values for each air sample.
   5. HVAC operating conditions.
   6. Other information specified in ASHRAE 129.
   7. Other conditions or discrepancies that might have influenced results.

1.7 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 3 years' experience in performing the types of testing specified.

PART 2 PRODUCTS

2.1 MATERIALS

A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
B. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE 52.2.

PART 3 EXECUTION

3.1 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:
   1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
   2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
   3. Provide sufficient ventilation for drying within reasonable time frame.
B. Begin construction ventilation when building is substantially enclosed.
C. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.
D. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.
E. HVAC equipment and supply air ductwork may be used for ventilation during construction:
   1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
   2. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency.
   3. Where return air ducts must be used for ventilation, install auxiliary filters at return inlets, sealed to ducts; use filters with at least the equivalent efficiency as those required at supply air side; inspect and replace filters when they lose efficiency.

F. Do not store construction materials or waste in mechanical or electrical rooms.
G. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
    1. Inspect duct intakes, return air grilles, and terminal units for dust.
    2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
    3. Clean tops of doors and frames.
    4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
    5. Clean return plenums of air handling units.
    6. Remove intake filters last, after cleaning is complete.
H. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
I. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

3.2 BUILDING FLUSH-OUT – REQUIRED FOR NEW CONSTRUCTION

A. Perform building flush-out before occupancy.
B. Do not start flush-out until:
    1. All construction is complete.
    2. HVAC systems have been tested, adjusted, and balanced for proper operation.
    3. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
    4. New HVAC filtration media have been installed.
C. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot (4500 cubic meters per square meter) of floor area has been supplied.
    1. Obtain Owner's concurrence that construction is complete enough before beginning flush- out.
    2. Maintain interior temperature of at least 60 degrees F (15 degrees C) and interior relative humidity no higher than 60 percent.
    3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.
    4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 25 percent of the total air volume prior to occupancy, and:
        a. Begin ventilation at least three hours prior to daily occupancy.
        b. Continue ventilation during all occupied periods.
        c. Provide minimum outside air volume of 0.30 cfm per square foot (0.0015 cubic meters) or design minimum outside air rate, whichever is greater.
D. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.3 AIR CONTAMINANT TESTING – OWNER'S OPTION: NEW CONSTRUCTION

A. Perform air contaminant testing before starting construction, as base line for evaluation of post- construction testing.
B. Perform air contaminant testing before occupancy.
C. Do not start air contaminant testing until:
    1. All construction is complete, including interior finishes.
    2. HVAC systems have been tested, adjusted, and balanced for proper operation.
    3. New HVAC filtration media have been installed.
D. Indoor Air Samples: Collect from spaces representative of occupied areas:
    1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.
    2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet (2300 square meters); take samples from areas having the least ventilation and those having the greatest presumed source strength.
    3. Collect samples from height from 36 inches (915 mm) to 72 inches (1830 mm) above floor.
    4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
    5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
    6. When retesting the same building areas, take samples from at least the same locations as in first test.
E. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.
F. Analyze air samples and submit report.
G. Air Contaminant Concentration Determination and Limits:
    1. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.
    2. Airborne Mold and Mildew: Measure in relation to outside air; not higher than outside air.
    3. Formaldehyde: Not more than 27 parts per billion.
    4. Total Volatile Organic Compounds (TVOC): Not more than 500 micrograms per cubic meter.
    5. 4-Phenylcyclohexene (4-PCH): Not more than 6.5 micrograms per cubic meter.
    6. Particulates (PM10): Not more than 50 micrograms per cubic meter.
    7. Total Particulates (PM): Measure in micrograms per cubic meter, in relation to outside air; not more than 20 micrograms per cubic meter higher than outside air.
    8. Regulated Pollutants: Measure in relation to outside air; not more than contained in outside air.

H. If air samples show concentrations higher than those specified, ventilate with 100 percent outside air and retest at no cost to Owner, or conduct full building flush-out specified above.

3.4 VENTILATION EFFECTIVENESS TESTING

A. Perform ventilation effectiveness testing before occupancy.
B. Do not begin ventilation effectiveness testing until:
    1. HVAC testing, adjusting, and balancing has been satisfactorily completed.
    2. Building flush-out or air contaminant testing has been completed satisfactorily.
    3. New HVAC filtration media have been installed.
C. Test each air handler zone in accordance with ASHRAE 129.
D. If calculated air change effectiveness for a particular zone is less than 0.9 due to inadequate balancing of the system, adjust, and retest at no cost to Owner.

End of Section 01 57 21

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Sections:

1. Division 01 Section "Allowances" for products selected under an allowance.
2. Division 01 Section "Alternates" for products selected under an alternate.
3. Division 01 Section "Substitution Procedures" for requests for substitutions.
4. Division 01 Section "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in “Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 10 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
    a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
    1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
    2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
    3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
    4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
    1. Store products to allow for inspection and measurement of quantity or counting of units.
    2. Store materials in a manner that will not endanger Project structure.
    3. Store products that are subject to damage by the elements, under cover in a weather tight enclosure above ground, with ventilation adequate to prevent condensation.

4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
   2. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.
C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.
   5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product. Contractor to obtain approval for use of products listed.

B. Product Selection Procedures:
   1. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   2. Products:
      a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered, unless otherwise indicated.
   3. Manufacturers:
      b. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered, unless otherwise indicated.
      c. Non-restricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
   4. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
   1. Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 EXECUTION (Not Used)

End of Section 01 60 00

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 61 16 – VOLATILE ORGANIC COMPOUND CONTENT RESTRICTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. VOC restrictions for product categories listed below under "DEFINITIONS."
B. All products of each category that are installed in the project must comply; Owner's project goals do not allow for partial compliance.

1.2 DEFINITIONS

A. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site in the building interior:
   1. Adhesives, sealants, and sealer coatings.
   2. Carpet.
   3. Carpet cushion.
   4. Carpet tile.
   5. Resilient floor coverings.
   6. Wood flooring.
   7. Paints and coatings.
   8. Insulation.
   9. Gypsum board.
   10. Acoustical ceilings and panels.
   11. Cabinet work.
   12. Student and teacher desks, tables, and chairs.
   13. Systems furniture and seating.
   14. Wall coverings.
   15. Composite wood and agrifiber products used either alone or as part of another product.
   16. Other products when specifically stated in the specifications.
B. Interior of Building: Anywhere inside the exterior weather barrier.
C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.3 REFERENCE STANDARDS

A. LEM - Low-Emitting Materials Product List; Collaborative for High Performance Schools
B. VOC - Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers
C. CRI (GLP) - Green Label Plus Carpet Testing Program - Approved Products; Carpet and Rug Institute; Current Edition.
D. GEI (SCH) - GREENGUARD "Children and Schools" Certified Products; GREENGUARD Environmental Institute; current listings at www.greenguard.org.
E. SCS (CPD) - SCS Certified Products; Scientific Certification Systems; current listings at www.scscertified.com.

1.4 SUBMITTALS

A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.

B. Evidence of Compliance: Submit for each different product in each applicable category.
    1. Identify evidence submittals with the words "LEED Report".
C. Product Data: For each VOC-restricted product used in the project, submit product data showing compliance, except when another type of evidence of compliance is required.
D. Installer Certifications for Accessory Materials: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of their products, or 2) that such products used comply with these requirements.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 MATERIALS

A. All VOC-Restricted Products: Provide products having VOC content of types and volume not greater than those specified.
    1. Product data submittals showing VOC content are NOT acceptable forms of evidence.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
B. All additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

End of Section 01 61 16

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Installation of the Work.
   3. Cutting and patching.
   4. Coordination of Owner-installed products.
   5. Progress cleaning.
   6. Starting and adjusting.
   7. Protection of installed construction.
   8. Correction of the Work.

B. Related Sections:
   1. Division 01 Section "Submittal Procedures" for submitting surveys.
   2. *Division 02 Section "Selective Structure Demolition" for demolition and removal of selected portions of the building.*
   3. Division–07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures prior to the time cutting and patching will be performed. Include the following information:
   1. Extent: Describe reason for and extent of each occurrence of cutting and patching if not part of the original scope of work.
   2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
   3. Products: List products to be used for patching and firms or entities that will perform patching work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate how long services and systems will be disrupted.

1.5 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect and district representative of locations and details of cutting. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that will result in increased maintenance or decreased operational life or safety. Operational elements may include the following but not be limited to:
   a. Primary operational systems and equipment.
   b. Fire separation assemblies.
   c. Air or smoke barriers.
   d. Fire-suppression systems.
   e. Mechanical systems piping and ducts.
   f. Control systems.
   g. Communication systems.
   h. Conveying systems.
   i. Electrical wiring systems.
   j. Operating systems of special construction.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, reduce their capacity to perform as intended, or that will result in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Exterior curtain-wall construction.
   d. Equipment supports.
   e. Piping, ductwork, vessels, and equipment.
   f. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment when applicable.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect and owner for the visual and functional performance of in-place materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping, underground electrical services, and other utilities.
2. Furnish location data for work related to project that must be performed by public utilities serving project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the work, examine substrates, areas, and conditions, with installer or applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. *Proceed with installation only after unsatisfactory conditions have been corrected.* Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing utility information: Furnish information to local utility company that is necessary to adjust, move, or relocate existing utility structures, utility poles,

lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Space requirements: Verify space requirements and dimensions of items shown diagrammatically on drawings.
C. Review of contract documents and field conditions: Immediately on discovery of the need for clarification of the contract documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."
D. Surface and Substrate Preparation: Comply with manufacturer's recommendations for p reparation of substrates to receive subsequent work.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect or owner's representative promptly.
B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.
    1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
    2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
    3. Inform installers of lines and levels to which they must comply.
    4. Check the location, level and plumb, of every major element as the Work progresses.
    5. *Notify Architect when deviations from required lines and levels exceed allowable tolerances.*
    6. Close site surveys with an error of closure equal to or less than the standard stablished by authorities having jurisdiction.
C. Site Improvements: Locate and lay out site improvements, including pavements, grading, ill and topsoil placement, utility slopes, and rim and invert elevations.
D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and owner's representative. Submit log at project completion for project records.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
   4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

F. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
2. Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

B. Temporary Support: Provide temporary support of work to be cut.
C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "Summary."
E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
    1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
    2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
    3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
    4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
    5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
    6. Proceed with patching after construction operations requiring cutting are complete.
G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even- plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather-tight condition.
6. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.
B. Coordination: Coordinate construction and operations of the work with work performed by owner's construction personnel.
   1. Construction Schedule: Inform owner of contractor's preferred construction schedule for owner's portion of the work. Adjust construction schedule based on a mutually agreeable timetable. Notify owner or owner’s representative fourteen (14) days prior to the start of owner’s contractor if changes to schedule are required due to differences in actual construction progress.
   2. Pre-installation Conferences: Include owner's construction personnel at pre-installation conferences covering portions of the work that are to receive owner's work. Attend pre- installation conferences conducted by owner's construction personnel if portions of the work depend on owner's construction.

3.7 PROGRESS CLEANING

A. General: *Clean Project site and work areas daily, including common areas.* Enforce requirements strictly. Dispose of materials lawfully.
   1. Provide necessary daily cleaning during construction to maintain premises and adjoining public properties free from construction waste, debris and rubbish, and dust caused by operations.
   2. At completion of each day, remove waste materials and rubbish; store tools, equipment, machinery and surplus materials; and clean all sight exposed surfaces.
   3. If Contractor fails to clean up each day and at the completion of his Work, the Owner may do so and charge the cost thereof to the Contractor. At his next pay application a deductive change order will be processed and there is no appeal for back charges due to clean up.
   4. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   5. Do not hold waste materials more than seven (7) days during normal weather or three (3) days if the temperature is expected to rise above 80 deg. F.
   6. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Utilize containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Cleaning Materials: Use only cleaning materials recommended by manufacturer of the surface to be cleaned. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

F. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

G. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to insure freedom from damage and deterioration at time of Substantial Completion.

H. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective

covering where required to ensure protection from damage or deterioration at Substantial Completion.

J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, whether completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

L. During Construction:

1. Oversee cleaning and ensure that building(s) and ground(s) are maintained free from accumulations of waste materials and rubbish.
2. Sprinkle dusty debris with water.
3. During progress of Work, clean-up site and access and dispose off waste materials, rubbish and debris at least once every week.
4. Provide dump containers and locate on site for collection of waste materials, rubbish and debris on a daily basis.
5. Do not allow waste materials, rubbish and debris to accumulate and become an unsightly or hazardous condition.
6. Remove waste materials, rubbish and debris from site and legally dispose off at public or private dumping area.
7. Lower waste materials in controlled manner with as few handlings as possible; do not drop or throw materials from heights.
8. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
B. Restore permanent facilities used during construction to their specified condition.
C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

End of Section 01 73 00

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
    1. Substantial Completion.
    2. Final Completion.
    3. Warranties.
    4. Final cleaning.

B. Related Sections:
    1. Division 01 Section "Execution" for progress cleaning of Project site.
    2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
    3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
    4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
    5. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.
    6. Forms located at the end of this Section 01 77 00:
        a. GC Closeout Checklist
        b. Conditional Waiver and Release on Final Payment
        c. Unconditional Waiver and Release on Final Payment
        d. Warranty Form
        e. Asbestos Free Letter Form
        f. Lead Free Letter Form
        g. PCB Free Letter Form

1.3 SUBSTANTIAL COMPLETION

A. Substantial Completion Certificate:
    1. Before requesting inspection for determining date of Substantial Completion, complete the requirements listed on the GC Closeout Checklist. Establish the date when the work is complete.
    2. Prepare a list of items to be completed and corrected (punch list), the value of item on the list, and reasons why the Work is not complete.
    3. Ensure required parties have accepted the work and executed the certificate.
    4. Advise the Owner of pending insurance changeover requirement.
    5. Grant the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits and similar releases.

6. Complete startup, commissioning, testing, manufacturer requirements, and corrections of all systems.
7. Establish the start date for the warranties.
8. Establish the completion of the contract time in order to determine if liquidated damages apply.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, the items listed in 1.3 of this section must be complete. The Contractor must also complete the items listed in the attached "General Contractor Closeout Checklist" at the end of this section.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
    1. Organize list of spaces in sequential order.
    2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
    3. Include the following information at the top of each page:
        a. Project name.
        b. Date.
        c. Name of Contractor.
        d. Page number.
    4. Submit list of incomplete items in the following format:
        a. PDF electronic file.
        b. Projects using the owner's designated software will require the punch list information to be input on an excel spread sheet. The example of the sheet is at the end of this specification section.

1.6 WARRANTIES

A. Submittal Time: All warranties shall commence on the date of substantial completion unless noted otherwise. Exceptions will have to be approved by architect and owner's representative and notes made on the AIA substantial completion document.
B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
    1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
    2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or

installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document. Coordinate paragraph below if Division 01 Section "Operation and Maintenance Data" is used.

Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Remove tools, construction equipment, machinery, and surplus material from Project site.
   d. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   e. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   f. Sweep concrete floors broom clean in unoccupied spaces.
   g. Vacuum carpet and similar soft surfaces, removing debris and

excess nap; shampoo if visible soil or stains remain.

h. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
i. Remove labels that are not permanent.
j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
k. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
    1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.
o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
p. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."

End of Section 01 77 00

General Contractor - Closeout Checklist

Not Applicable Items are to be Noted in the Remarks Column

Template Revised 8/10/2022

To: <<Name>>, Director of Design and Construction **Date:**

GC: **A/E Firm:**

BP#: **PM:**

School Name:

Project Type: ☐ Addition ☐ Renovations ☐ New Construction

Item #	Document Description	Primary Responsibility	Date Received by PM	Remarks	Req'd of JOC under $50K
	SUBSTANTIAL COMPLETION REQUIREMENTS - Closeout and Punch List Items are NOT to be billed at Substantial Completion				
a.	Fire Alarm System Components Completed	GC			X
b.	Local Fire Marshal Approval Certificate	GC			X
c.	HVAC Air and Water Balancing Completed	GC			X
d.	Energy Management Systems Completed	GC			X
e.	Communications Equipment and Telephone Systems Completed	GC			X
f.	Final Lockset Cores Installed	GC			X
g.	Room Plaques and Exterior Signage Completed	GC			X
h.	Owner Demonstrations and Training Completed	GC			X
i.	Exterior Clean-up and Landscaping Completed	GC			X
j.	Final Interior Clean-up Completed	GC			X
k.	Certificate of Occupancy	GC			X
l.	Punch List Report	GC, A/E			X
	FINAL COMPLETION REQUIREMENTS: CLOSEOUT ITEMS TO BE SUBMITTED WITH FINAL PAYMENT - Allowed billable amount on G702: 100% of contract amount mi				
1	**SUBSTANTIAL COMPLETION**				
a.	Certificate of Substantial Completion	PM			X
b.	Signed Off Punchlist	GC			X
2	**WARRANTIES**				
a.	List of Subcontractors and Suppliers	GC		Include Name, Address, Phone Number and Discipline	X
b.	Contractor's 1 year Warranty	GC			X
c.	Subcontractors' 1 year Warranties	GC			
d.	Manufacturers' Warranties	GC		A separate "Warranties" manual should be provided for guarantees, warranties, etc.	X

Item #	Document Description	Primary Responsibility	Date Received by PM	Remarks	Req'd of JOC under $50K
3	**EVIDENCE OF PAYMENT OF DEBTS AND CLAIMS**				
a.	"Contractor's Affidavit of Payment of Debts and Claims" (Confirm GC and Sub Lien Waivers are attached to form.)	GC			
b.	"Contractor's Final Affidavit of Release of Liens"; (Confirm GC and Sub Lien Waivers are attached to form.)	GC			
c.	"Consent of Surety Company to Final Payment"; (Confirm that Power of Attorney is attached to form.)	GC			X
4	**INSURANCE**				
a.	Certificate(s) of Insurance, All insurance must be maintained for one year following substantial completion	GC			X
b.	Written Statement that the Contractor Knows of no Substantial Reason that the Insurance will not be Renewable to Cover the Required Period	GC			
5	**OPERATIONS AND MAINTENANCE MANUALS AND EVIDENCE OF TRAINING**				
a.	O&M Manuals submitted by GC to A/E	GC		Per detailed list developed by GC and reviewed by A/E and PM. One Manual per each school to be split by CSI Divisions. Electronic Copy and 1 Hard Copy.	X
b.	Training Matrix, Sign-In sheet(s) and Videos.	GC		GC is to provide a sign-in sheet for each system for which training has been provided to indicate the person, title and date of completion of the training. 1 digital copy of Training Videos.	
6	**ATTIC STOCK / SPARE MATERIAL / KEY TRANSFER**				
a.	Signed off Transmittal of Extra (Attic) Stock	GC		Provided by GC and received by Principal or Campus Facilities Supervisor or Maintenance, as applicable	X
b.	Signed off Transmittal Key transfer (Accessory keys)	GC		Provided by GC and received by Principal or Campus Facilities Supervisor, as applicable.	X
7	**LOCAL AGENCIES APPROVALS (as applicable)**				
a.	Certificate of Occupancy	GC			X
b.	Final Building Inspections/Closed Construction Permits	GC		Green tags colored copies	X
c.	State Fire Marshal's Fire Alarm Inspection Certificate & Testing	GC			X
d.	Storm Water Prevention Pollution Plan (SWPPP)	GC			X
e.	Elevator Inspection Certificate	GC			X
f.	Boiler Inspection Certificate	GC			X
g.	Health Department Inspection Certificate	GC			X
8	**RECORD DOCUMENTS (DRAWINGS, SPECIFICATIONS, ETC.)**				
a.	Record Documents, Submit 1 Hard Copies and 1 PDF Copy	GC			
9	**GC DESIGNED DOCUMENTS (as applicable)**				
a.	Fire Alarm drawings	GC		Need AHJ approved documents.	X
b.	Security drawings	GC		Need AHJ approved documents (if applicable)	X
c.	HVAC Controls drawings	GC			X

Item #	Document Description	Primary Responsibility	Date Received by PM	Remarks	Req'd of JOC under $50K
d.	Fire Sprinkler System drawings	GC		Need AHJ approved documents.	X
e.	Data Cabling drawings	GC			X
10	**CERTIFICATIONS**				
a.	Certification of Asbestos Free Project: Letter from GC and **A/E**, Letters from Subs	GC, A/E			X
b.	Certification of Lead-Free Potable Water System: Letters from GC and Subs	GC			X
c.	Certification of PCB-Free Project: Letters from GC and Subs	GC			X
11	**FINAL SYSTEM REPORTS**				
a.	Final Test & Balance Report	T&B			
b.	Final Roof Inspection Report	Roof Inspector			
12	**LEED CONSTRUCTION SUBMITTAL**				
a.	Sustainable Sites *SSp1* - Construction Activity Pollution Prevention: **Erosion & Sedimentation Control Plan**	GC			
b.	Materials and Resources *MRp2 & MRc5* - Construction Waste Management: **Const. Waste Mgmt. Plan**	GC			
c.	Materials and Resources *MRc3* - Sourcing of Raw Materials: **Building Product Disclosure & Optimization Calculator (BPDO)**	GC			
d.	Environmental Quality *EQc3* - **IAQ Management Plan for Construction and Preoccupancy Phases**	GC			
e.	Environmental Quality *EQc2* - Low Emitting Materials: **Low Emitting Materials Calculator**	GC			
13	**FINAL COMPLETION**				
a.	Copy of Final Change Order	A/E, GC, PM			X
b.	TEA - Certification of Project Compliance	A/E, GC, FBISD, PM			
c.	TAS/TDLR Certification (if applicable)	AE			
d.	Complete Set of Approved Submittals Log from Prolog	GC		Include Prolog Summary Log in Binder	
e.	Final Completion Certificate	A/E, GC, PM			X
	RETAINAGE				
a.	FBISD Retention Release Reduction Worksheet	PM			X
b.	Purchase Order Closure	PC			X
	WARRANTY INSPECTIONS				
a.	11 month inspection after Date of Substantial Completion	PM			

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CONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

Project _____

Job No. _____

On receipt by the signer of this document of a check from _____ (maker of check) in the sum of $_____ payable to _____ (payee or payees of check) and when the check has been properly endorsed and has been paid by the bank on which it is drawn, this document becomes effective to release any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position that the signer has on the property of _____ (owner) located at _____ (location) to the following extent: _____ (job description).

This release covers the final payment to the signer for all labor, services, equipment, or materials furnished to the property or to _____ (person with whom signer contracted).

Before any recipient of this document relies on this document, the recipient should verify evidence of payment to the signer.

The signer warrants that the signer has already paid or will use the funds received from this final payment to promptly pay in full all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project up to the date of this waiver and release.

Date _____

_____ (Company name)

By _____ (Signature)

_____ (Title)

==========

NOTE: Section 53.281(b)(2), Texas Property Code, requires that the above form be notarized. See Chapter 121, Texas Civil Practice & Remedies Code, regarding Acknowledgments & Proofs of Written Instruments, or consult an attorney. For short acknowledgement forms that might be suitable, see Section 121.008 in Chapter 121. Click here to go there.

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NOTICE:

This document waives rights unconditionally and states that you have been paid for giving up those rights. It is prohibited for a person to require you to sign this document if you have not been paid the payment amount set forth below. If you have not been paid, use a conditional release form.

UNCONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

Project _____

Job No. _____

The signer of this document has been paid in full for all labor, services, equipment, or materials furnished to the property or to _____ (person with whom signer contracted) on the property of _____(owner) located at _____(location) to the following extent: _____ (job description). The signer therefore waives and releases any mechanic's lien right, any right arising from a payment bond that complies with a state or federal statute, any common law payment bond right, any claim for payment, and any rights under any similar ordinance, rule, or statute related to claim or payment rights for persons in the signer's position.

The signer warrants that the signer has already paid or will use the funds received from this final payment to promptly pay in full all of the signer's laborers, subcontractors, materialmen, and suppliers for all work, materials, equipment, or services provided for or to the above referenced project up to the date of this waiver and release.

Date _____

_____(Company name)

By _____(Signature)

_____(Title)

==========

NOTE: Section 53.281(b)(2), Texas Property Code, requires that the above form be notarized. See Chapter 121, Texas Civil Practice & Remedies Code, regarding Acknowledgments & Proofs of Written Instruments, or consult an attorney. For short acknowledgement forms that might be suitable, see Section 121.008 in Chapter 121. Click here to go there.

WARRANTY LETTER

PLEASE PRINT ON YOUR COMPANY LETTERHEAD

WARRANTY FOR:

Fort Bend ISD BOND 2023:

We, the undersigned, hereby warrant that Work described above which we have furnished and/or installed for the following project:

PROJECT TITLE: Job # _____,

PROJECT ADDRESS:

_____

The project is in accordance with the Contract Documents, including guaranteeing all of the work under the contract to be free from faulty materials in every particular, and free from improper workmanship, and against injury except from proper and usual wear and tear; and agreeing to replace or re-execute without cost to the Owner such work as may be found to be improper, imperfect or of unsatisfactory material and/or workmanship, without cost to the Owner, and to make good all damage caused to other work or materials, or to the Owner's property, real and personal, due to such improper, imperfect or faulty material and/or workmanship, and/or due to the required replacement or re-execution. Such warranty periods shall be maintained notwithstanding that certain systems may be activated prior to Substantial Completion as required for the satisfactory completion of the project. This guarantee shall be made to cover a period of one (1) year from the date of Substantial Completion as certified by the Architect under this Contract.

CONTRACTOR:

Company Name: _____

By:_____
(Signature)

_____
(Contact Name & Title)

_____
(Address)

_____
(Phone Number)

(PROJECT NAME) ASBESTOS FREE AFFIDAVIT
FBISD PROJECT NO:

ASBESTOS FREE AFFIDAVIT

I understand that the Fort Bend Independent School District, in order to protect the students, staff and public in general from any unnecessary exposure to asbestos fibers, and to comply with the Asbestos Hazard Emergency Response Act prohibits the use of asbestos containing materials in all forms in the construction and operation of their facilities.

I certify that I am familiar with the materials used in the construction of, and incorporated into, the construction described below. I further certify that to the best of my knowledge and belief, no asbestos containing building materials (ACBM) either friable or otherwise were used in the process of construction or incorporated into the construction of the building.

CAMPUS LOCATION:

SCOPE OF WORK: _____

SPECIFICATION SECTION(S): _____

SUBCONTRACTOR: _____

_____ _____
General Contractor's Signature Date

_____
General Contractor's Printed Name & Title

Failure to complete this waiver constitutes non-compliance with the job specifications and an unacceptable job.

Signed before me this ___ day of _____, 20____

Notary Public: _____

My commission expires: _____

As the architect and/or project engineer responsible for the above said project I certify that no asbestos containing building materials were specified as a building material in the building as specified in 40 CFR 763.99(a)(7).

_____ _____

_____ _____ _____
Architect's or Project Engineer's Stamp Signature Date

LEAD FREE AFFIDAVIT

I understand that the Fort Bend Independent School District, in order to protect the students, staff and public in general from any unnecessary exposure to Lead, and to comply with the U.S. Code for a "LEAD FREE" drinking water system. "No person may use any pipe, any pipe or plumbing fitting or fixture, any solder, or any flux, after June 19, 1986, in the installation or repair of- (i) any public water system; or (ii) any plumbing in a residential or nonresidential facility providing water for human consumption, that is not LEAD FREE (within the meaning of subsection (d) of this section). [42 USC§ 300g-6]"

I certify that I am familiar with the materials used in the construction of, and incorporated into, the construction described below. I further certify that to the best of my knowledge and belief, no lead containing building materials were used in the process of construction or incorporated into the construction of the drinking water system in the building.

CAMPUS(ES):

SCOPE OF WORK: _____

SPECIFICATION SECTION(S): _____

SUBCONTRACTOR: _____

_____ _____
General Contractor's Signature Date

_____
General Contractor's Printed Name & Title

Failure to complete this waiver constitutes non-compliance with the job specifications and an unacceptable job.

Signed before me this ___ day of _____, 20____

Notary Public: _____

My commission expires: _____

As the architect and/or project engineer responsible for the above said project I certify that no lead containing building materials were specified as a building material in the building as specified in 42 U.S. Code§ 300g-l - National drinking water regulations.

_____ _____
Architect's or Project Engineer's Stamp Signature Date

(PROJECT NAME)
FBISD PROJECT NO: PCB FREE AFFIDAVIT

PCB FREE AFFIDAVIT

I understand that the Fort Bend Independent School District, in order to protect the students, staff and public in general from any unnecessary exposure to polychlorinated biphenyls (PCB's), and to comply with the U.S. Environmental Protection Agency's recommendation for schools to eliminate PCB containing building material in all forms in the construction and operation of their facilities. I certify that I am familiar with the materials used in the construction of, and incorporated into, the construction described below. I further certify that to the best of my knowledge and belief, no polychlorinated biphenyls containing building materials (PCBs) were used in the process of construction or incorporated into the construction of the building.

CAMPUS(ES):

SCOPE OF WORK: _____

SPECIFICATION SECTION(S): _____

SUBCONTRACTOR: _____

_____ _____
General Contractor's Signature Date

_____
General Contractor's Printed Name & Title

Failure to complete this waiver constitutes non-compliance with the job specifications and an unacceptable job.

Signed before me this ___ day of _____, 20____

Notary Public: _____

My commission expires: _____

As the architect and/or project engineer responsible for the above said project I certify that no PCB containing building materials were specified as a building material in the building as specified in 40 CFR 761.20.

_____ _____
Architect's or Project Engineer's Stamp Signature Date

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory.
   2. Operation manuals for systems, subsystems, and equipment.
   3. Product maintenance manuals.
   4. Systems and equipment maintenance manuals.

B. Related Sections:
   1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
   2. Division 02 Section “Demonstration and Training” for instructing Owner’s personnel in the maintenance of the products and in the operation of equipment and systems.
   3. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or sub-systems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:
   1. PDF electronic file. Assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Architect and owner’s representative.
      a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
      b. Enable ~~inserted~~ reviewer comments on draft submittals.
   2. One (2) paper copy and (2) electronic copies on separate usb devices delivered at substantial completion.
   3. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 calendar days before commencing demonstration and training. Architect

will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion. Architect will return copy with comments.
   1. Correct or modify each manual to comply with Architect and owner's representative Comments. Submit copies of each corrected manual within 10 days of receipt of Comments and prior to commencing demonstration and training.

PART 2 PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:
   1. List of documents.
   2. List of systems.
   3. List of equipment.
   4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name and contact information for Contractor.
   6. Name and contact information for Architect.
   7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
    1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
    1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
    2. File Names and Bookmarks: Enable bookmarking of individual documents based upon file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel upon opening file.
F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
    1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
        a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
        b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of content. Indicate volume number for each of the three required multiple-volume sets.
    2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
    3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.

4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
    1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
    2. Performance and design criteria if Contractor is delegated design responsibility.
    3. Operating standards.
    4. Operating procedures.
    5. Operating logs.
    6. Wiring diagrams.
    7. Control diagrams.
    8. Piped system diagrams.
    9. Precautions against improper use.
    10. License requirements including inspection and renewal dates.
B. Descriptions: Include the following:
    1. Product name and model number. Use designations for products indicated on Contract Documents.
    2. Manufacturer's name.
    3. Equipment identification with serial number of each component.
    4. Equipment function.
    5. Operating characteristics.
    6. Limiting conditions.
    7. Performance curves.
    8. Engineering data and tests.
    9. Complete nomenclature and number of replacement parts.
C. Operating Procedures: Include the following, as applicable:
    1. Startup procedures.
    2. Equipment or system break-in procedures.
    3. Routine and normal operating instructions.
    4. Regulation and control procedures.
    5. Instructions on stopping.
    6. Normal shutdown instructions.
    7. Seasonal and weekend operating instructions.
    8. Required sequences for electric or electronic systems.
    9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation and diagram controls as installed.
E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
B. Source Information: List each product included in the manual, identify them by product name, and arrange to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
C. Product Information: Include the following, as applicable:
    1. Product name and model number.
    2. Manufacturer's name.
    3. Color, pattern, and texture.
    4. Material and chemical composition.
    5. Reordering information for specially manufactured products.
D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
    1. Inspection procedures.
    2. Types of cleaning agents to be used and methods of cleaning.
    3. List of cleaning agents and methods of cleaning detrimental to product.
    4. Schedule for routine cleaning and maintenance.
    5. Repair instructions.
E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
    1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
B. Source Information: List each system, subsystem, and piece of equipment included in the manual, identify by product name and arrange to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section

number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Provide transmittal from district's construction management software for transmittance of extra parts.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 3 EXECUTION

3.1 MANUAL PREPARATION

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
    1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
    2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
    1. Do not use original project record documents as part of operation and maintenance manuals.
    2. Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."
E. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

End of Section 01 78 23

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

B. Related Sections:
   1. Division 01 Section "Execution" for final property survey.
   2. Division 01 Section "Closeout Procedures" for general closeout procedures.
   3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   4. Divisions 02 through 49 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit one set(s) of marked-up record prints.
   2. Number of Copies: Submit copies of record Drawings as follows:
      a. Initial Submittal: Submit one paper copy set as well as PDF electronic files of marked-up record prints and two sets of plots from corrected record digital data files on a single usb device. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal: Submit one paper copy set, a PDF electronic files of marked-up record prints on a single usb device.

B. Record Specifications: Submit as PDF electronic file of Project's Specifications, including addenda and contract modifications on a single usb device.

C. Record Product Data: Submit as PDF electronic file of each approved submittal.
   1. Submit where record Product Data are required as part of operation and maintenance manuals. Miscellaneous Record Submittals: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy set as well as PDF electronic files of each submittal.

PART 2 PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an acceptable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding archive photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations below first floor.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, submit marked- up record prints to Architect. The Architect will then prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Annotated PDF electronic file.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark specifications to indicate the actual product installation where installation varies from that indicated in specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Specifications as a paper copy as well as in scanned PDF electronic file(s) of marked up paper copy.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as a paper copy as well as scanned PDF electronic file(s) of marked up paper copy.
    1. Include record Product Data directory organized by specification section number and title, electronically linked to each item of record Product Data.

PART 3 EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

End of Section 01 78 39

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.
   3. Demonstration and training video recordings.
   4. O&M Manuals should be uploaded into Owner’s designated software (Kahua)

B. Related Sections:
   1. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. Indicate proposed training modules utilizing manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies with closeout documentation per section 01 77 00 closeouts.
   1. Identification: On each copy, provide an applied label with the following information:
      a. Name of Project.
      b. Name and address of videographer.
      c. Name of Architect.
      d. Name of Contractor.
      e. Date of video recording.
   2. At completion of training, submit complete training manual(s) for Owner's use.

1.5 QUALITY ASSURANCE

A. Instructor Qualifications: A qualified representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations. Provide a minimum (14) day advanced notice.
B. Coordinate instructors, including providing notification of dates, times, length of instruction time, a nd course content.
C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
B. Training Modules: Develop a learning objective and teaching outline for each module. For each module, include instruction for the following as applicable to the system, equipment, or component:
    1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
        a. System, subsystem, and equipment descriptions.
        b. Performance and design criteria if Contractor is delegated design responsibility.
        c. Operating standards.
        d. Regulatory requirements.
        e. Equipment function.
        f. Operating characteristics.
        g. Limiting conditions.
        h. Performance curves.
    2. Documentation: Review the following items in detail as applicable:
        a. Emergency manuals.
        b. Operations manuals.
        c. Maintenance manuals.
        d. Project record documents.
        e. Identification systems.
        f. Warranties and bonds.
        g. Maintenance service agreements and similar continuing commitments.
    3. Emergencies: Include the following, as applicable:
        a. Instructions on meaning of warnings, trouble indications, and error messages.
        b. Instructions on stopping.
        c. Shutdown instructions for each type of emergency.
        d. Operating instructions for conditions outside of normal operating limits.
        e. Sequences for electric or electronic systems.
        f. Special operating instructions and procedures.
    4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.
7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with r equirements in Division 01 Section "Operations and Maintenance Data."
B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Owner will furnish an instructor to describe Owner's operational philosophy.
   2. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner’s representative with at least 14 days advance notice.

C. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

B. Video Recording Format: Provide high-quality color video recordings with menu navigation in format acceptable to Architect and owner’s representative.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

End of Section 01 77 00

SECTION 02 41 01
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Demolition of items scheduled excluding removal of hazardous materials and toxic substances.

B. Selective demolition of built site elements.

C. Selective demolition of building elements for alteration and addition purposes.

D. Abandonment and removal of existing utilities and utility structures as indicated.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.04 SUBMITTALS

B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.

C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.05 QUALITY ASSURANCE

A. Project Conditions
   1. Visit the site as required to become familiar with existing conditions.
   2. Note all conditions as to character and extent of work involved for demolition.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

A. Remove portions of existing buildings in the following sequence:

B. Remove paving and curbs as required to accomplish new work.

C. Remove all other paving and curbs within site boundaries.

D. Remove other items indicated, for salvage, relocation, and recycling.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain and pay for all required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Use of explosives is not permitted.
   4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   5. Provide, erect, and maintain temporary barriers and security devices.
   6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permit.
   9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
   11. Coordinate with all utility providers as required for demolition of electrical, water, sanitary, storm and any other utilities present on the site and building.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

D. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

E. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

F. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Dismantle existing construction and separate materials.
   2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

G. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions in locations indicated on drawings.
   2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings or as required to minimize noise into occupied areas.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and Security): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

3.05 BUILDING DEMOLITION

A. Coordinate all work with the city having jurisdiction, and all applicable utility companies, and governing authorities.

B. Before commencing the work of this Section, verify with Architect all items to be removed. Schedule the work in a careful manner with all necessary consideration for the public and the Owner. Owner shall have the right of salvage to all items of existing equipment and materials such as door hardware, scrap copper, light fixtures, plumbing fixtures, accessories or any other item of value to the Owner. The equipment and material shall remain the property of the Owner and shall be delivered to a site designated by the Owner.

C. Completely remove all building structure, building slabs, and all plumbing lines that occur within 60 inches beneath grade or as indicated in the drawings whichever is greater. Cap all plumbing and utility lines abandoned or as indicated in the drawings. Building foundations, including grade beams shall be removed completely. Drilled piers shall be removed to a minimum dept of 60” below grade unless they conflict with new work and then they shall be removed completely.

D. Remove walks and drives as shown on the drawings. Protect existing street curbs shown to remain.

E. All material removed under this contract, which is not to be salvaged or sold at the “memorabilia sale”, shall become the property of the Contractor, and be promptly removed from the site. At all times, use movable debris boxes, covered, to convey the material through the building. Do not store or permit debris to accumulate on site.

F. Conduct operations so as not to interfere with adjacent roads, streets, drives, walks, services lines, and the like.

G. Disconnect any electric, telephone, gas, water, steam or other injection lines servicing the structure per rules and regulations of authorities having jurisdiction, as specified, or as directed by the Architect, but always maintain existing building to remain operational at all times.

H. Backfill any trenches caused by demolition work, in accordance with Section 31 23 33 - Trenching and Backfilling.

I. Remove all debris from the building premises and leave construction site “broom clean” each day. All debris shall be dumped in an approved disposal facility. All fees for this shall be paid by the Contractor.

J. All work shall be subject to phasing of construction.

K. Keep all pedestrian areas clear for passage at all times.

L. Upon completion of demolition of all existing structures, drives, fences, and utility lines, grade site with imported select fill and regrade so no evidence exists that structures were ever present on the site. Slope fill to natural drainage patterns so that ponding doesn’t occur. Bring fill elevations up to surrounding existing grade elevations.

3.06 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 41 01

SECTION 02 41 16

SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged; or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.
1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's and other tenants' on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services, if any.

C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

D. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements. Submit before Work begins.

E. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
1. Before selective demolition, Owner will remove the following items:

a. List to be determined during bid phase.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.10 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey existing conditions of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
2. Steel Tendons, if any: Locate tensioned steel tendons and include recommendations for de-tensioning.

F. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs, or preconstruction videotapes as appropriate.
1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.

3.2 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.3 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.4 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill unless otherwise directed by Owner.
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 16

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.
1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property [**,** for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

D. Predemolition Photographs or Video: Submit before Work begins.

1.7 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
   1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."
   2. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
   3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
      a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      b. Equipment to Be Removed: Disconnect and cap services and remove equipment.
      c. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

B. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Comply with requirements for access and protection specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's storage area designated by Owner. Protect items from damage during transport and storage.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.
   1. Remove existing roof membrane, flashings, copings, and roof accessories.
   2. Remove existing roofing system down to substrate.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

4. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 03 05 80

UNDER-SLAB VAPOR BARRIER/RETARDER

PART 1 - GENERAL

1.1 SUMMARY

A. Products Supplied Under This Section
   1. Vapor Barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs.

B. RELATED SECTIONS
   1. Section 03 30 00 Cast-in-place Structural Concrete
   2. Section 01 45 23 Structural Testing and Inspection

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM E 1745-97 (2004) Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
   2. ASTM E 154-88 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
   3. ASTM E 96-95 Standard Test Methods for Water Vapor Transmission of Materials
   4. ASTM E 1643-98 (2005) Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

B. American Concrete Institute (ACI)
   1. ACI 302.2R-06 Vapor Barrier Component (plastic membrane) is not less than 10 mils thick.

1.3 SUBMITTALS

A. Quality Control / Assurance
   1. Full set of test results as per paragraph 8.3 of ASTM E 1745.
   2. Manufacturer’s samples, literature
   3. Manufacturer’s installation instructions for placement, seaming and pipe boot installation.

1.4 SUBSTITUTIONS

A. Product Review
   1. Request must be made 14 days prior to bid date to allow time for proper review. Reviews will be at contractor’s expense.
   2. Independent laboratory test results showing compliance with ASTM E 1745 Class A, a permeance less than 0.01 Perms (grains/(ft2 *hr * in. Hg) before and after the mandatory conditioning tests ASTM E 154 Sections 8,11,12, and 13. (Woven, and recycled plastics are not permitted
   3. Incomplete substitutions will not be accepted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vapor Barrier (Performance based specification). When the specifications of different sections conflict, the contractor shall perform to the most restrictive provision. Vapor Barrier membrane must have the following properties.
   1. Permeance as tested after mandatory conditioning (ASTM E 154 sections 8,11,12,13) less than 0.01 Perms [grains/(ft2 *hr * in.Hg)]
   2. Other performance criteria

a. Strength: ASTM E 1745 Class A
b. Thickness: 15 mils minimum

B. Vapor Barrier Products.
1. Basis of Design: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com.
2. Barrier-Bac VB350 (15 mil) manufactured by Inteplast Group, 877-535-0555, www.BarrierBac.com
3. Vapor Block 15 manufactured by Raven Industries, 605-336-2750, www.ravenind.com
4. Griffolyn 15 mil manufactured by Reef Industries, 800-231-6074, www.reefindustries.com

2.2 ACCESSORIES

A. Seam Tape
1. Tape must have the following qualities:
a. Water Vapor Transmission Rate ASTM E 96, 0.3 perms or lower
2. Seam Tape
a. Manufacturer's standard seam tape.
b. Stego Crete Claw (for slabs on void boxes).

B. Vapor Proofing Mastic
1. Mastic must have the following qualities:
a. Water Vapor Transmission Rate ASTM E 96 0.3 perms or lower

C. Pipe Boots
1. Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by architect or geotechnical firm
1. Level and tamp or roll aggregate, sand or tamped earth base.

3.2 INSTALLATION

A. Install Vapor Barrier/Retarder:
1. Installation shall be in accordance with manufacturer's written instructions and ASTM E 1643-09.
a. Unroll Vapor Barrier/Retarder with the longest dimension parallel with the direction of the pour.
b. Lap Vapor Barrier/Retarder over footings or seal to foundation walls.
c. Overlap joints 6 inches and seal with manufacturer's tape.
d. Seal all penetrations (including pipes) per manufacturer's instructions.
e. No penetration of the Vapor Barrier/Retarder is allowed except for reinforcing steel and permanent utilities.
f. Repair damaged areas by cutting patches of Vapor Barrier/Retarder, overlapping damaged area 6 inches and taping all four sides with tape.

END OF SECTION 03 05 80

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete formwork, for the following:
1. Footings and/or piers.
2. Foundation walls.
3. Slabs-on-grade.
4. Concrete toppings.

B. Related Sections:
1. Section 01 45 23 “Testing and Inspection Services”.
2. Section 03 30 00 “Cast In Place Concrete”.
3. Section 03 20 00 “Concrete Reinforcing”.

1.3 REFERENCES

A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
1. American Concrete Institute (ACI):
   a. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials
   b. ACI 301 – Specifications for Structural Concrete for Buildings
   c. ACI 318 – Building Code Requirements for Structural Concrete
   d. ACI 347 – Guide to Formwork for Concrete
   e. ACI SP-4 – Formwork for Concrete.

1.4 PERFORMANCE REQUIREMENTS

A. Design and engineering of formwork, including shores, reshores, false work, bracing, and other temporary supports as well as determining when temporary supports and bracing can safely be removed after the specified curing time is the Contractor’s responsibility.

B. All components of the formwork shall be designed to support all loads imposed during construction including weight of construction equipment, live loads, and lateral loads due to wind and imbalance or discontinuity of building components.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Shop drawings for layout of pan type forms, if they exist on the project. Layout only - information and details about the support of these forms is not required, as it is the responsibility of the Contractor and his registered engineer
1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

C. Manufacturer’s product data and installation instruction for propriety materials used in exposed concrete work including form liners, release agents, form systems, ties, and accessories.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver form materials in manufacturer's packaging with installation instructions.

B. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician. An experienced installer who has completed work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.

B. Testing Agency Qualifications: Refer Section 01 45 23.

C. Layout and measurement of concrete forms and embedment's, required for work, performed by a licensed surveyor employed by the contractor.

D. Design, engineering and construction, and removal of formwork are the responsibility of the contractor.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Preinstallation Conference: Conduct conference at Project site.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
a. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Permanent Metal Forms for Slabs: Deck material, gauge and rib pattern shall be as noted on Drawings.

E. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
1. Pans shall be free of dents, irregularities, sag, rust or other deterioration.
2. In areas permanently exposed to view, provide one piece units, manufactured to length between beams or ribs, or segmented units with reinforced butt-joint splices.

F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

H. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

I. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch
3. Class C, 1/2 inch
4. Class D, 1 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts that are attached to the formwork.
1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.
4. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
3. Determine compressive strength of in place concrete by testing representative field-cured test specimens according to ACI 301.

B. Obtaining concrete compressive strength tests for the purposes of form removal shall be the responsibility of the Contractor.

C. In the absence of cylinder tests, formwork shall remain in place until the concrete has cured at a temperature of at least 50 degrees Fahrenheit (10 degrees Celsius) for the minimum cumulative time periods given in ACI 347, Section 3.7.2.3. When the surrounding air temperature is below 50 degrees Fahrenheit (10 degrees Celsius), that time period shall be added to the minimum listed time period.

D. Formwork for two-way conventionally reinforced slabs shall remain in place for at least the minimum cumulative time periods specified for one-way slabs of the same maximum span. Two-way conventionally reinforced slabs shall then be reshored until they attain the specified 28 day strength.

E. Minimum cumulative curing times may be reduced by the use of high-early strength cement or forming systems that allow form removal without displacing shores. However, the Contractor must demonstrate, to the satisfaction of the Architect, that the early removal of forms will not result in excessive sag, distortion or damage to the concrete elements.

F. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

G. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 REUSE OF FORMS

A. Clean and repair surfaces of forms to be used in the Work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form release agent.

B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Otherwise, locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants are to be installed.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
   1. Apply scratch finish to surfaces indicated or to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated or to receive trowel finish or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

3.8 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment

END OF SECTION 03 10 00

SECTION 03 2000

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete reinforcement, for the following:
   1. Footings and/or piers.
   2. Foundation walls.
   3. Slabs-on-grade.
   4. Concrete toppings.

B. Related Sections:
   1. Section 01 45 23 “Testing and Inspection Services”.
   2. Section 03 10 00 “Concrete Forming and Accessories”.
   3. Section 03 30 00 “Cast In Place Concrete”.
   4. Section 31 63 29 "Drilled Concrete Piers and Shafts".

1.3 REFERENCES

A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
   1. American Concrete Institute (ACI)
      a. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
      b. ACI 301 – Specifications for Structural Concrete for Buildings
      c. ACI 315 – Details and Detailing of Concrete Reinforcement
      d. SP-66 ACI Detailing Manual
   2. American Welding Society (AWS)
      a. AWS D1.1 – Structural Welding Code
   3. Concrete Reinforcing Steel Institute (CRSI)
      a. CRSI – Manual of Standard Practice
      b. CRSI 63 – Recommended Practice for Placing Reinforcing Bars
      c. CRSI 65 – Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

B. American Society of Testing Materials (ASTM)
   a. ASTM-A185: Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete Reinforcement.
   b. ASTM-A663: Standard Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties.
   c. ASTM-A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   d. ASTM-A675: Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties.
   e. ASTM-A706: Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   f. ASTM-A775: Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
   g. ASTM-A884: Standard Specification for Epoxy-Coated Wire and Welded Wire Reinforcement.

C. In the case of conflict between the Contract Documents and a reference standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement, according to ACI 315 “Details and Detailing of Concrete Reinforcement.”
1. Do not reproduce the structural drawings for use as shop drawings.

C. Bar Supports: Submit manufacturer’s product information for bolsters, chairs, spaces, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency, installer, and fabricator as indicated herein.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
1. Steel reinforcement and accessories.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Refer Section 01 45 23.

B. Installer Qualifications: An experienced installer who has completed reinforcing installation work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.

C. Fabricator Qualifications: An experienced fabricator who has completed reinforcing fabrication work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code - Reinforcing Steel."

E. Preinstallation Conference: Conduct conference at Project site.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete subcontractor.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings, if any, on steel reinforcement.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615, Grade 60 for #6 and smaller bars, Grade 75 for #7 and larger bars, deformed.

C. Low-Alloy-Steel Reinforcing Bars for bars to be welded: ASTM A 706, Grade 60 for #6 and smaller bars, Grade 75 for #7 and larger bars, deformed.

D. Stainless-Steel Reinforcing Bars: ASTM A 955, Grade 60, [Type 304] [Type 316L], deformed.

E. Steel Bar Mats: ASTM A 184, fabricated from ASTM A 615, Grade 60 or ASTM A 706, deformed bars, assembled with clips.

F. Plain-Steel Wire: ASTM A 82, as drawn .

G. Deformed-Steel Wire: ASTM A 496.

H. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

I. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
   2. Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, or other unacceptable materials.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." Combined tolerances for formwork, reinforcing fabrication, and reinforcing placement shall not permit a reduction in specified concrete cover of reinforcing steel. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken material. Bars used for concrete reinforcement shall meet following requirements for fabricating tolerances:
   1. Sheared length: Plus or minus 1 inch.
   2. Depth of truss bars: Plus 0, minus ½ inch.
   3. Overall dimensions of stirrups, ties, and spirals: Plus or minus ½ inch.
   4. Other bends: Plus or minus 1 inch.

B. For bars with end bearing splice couplers, bar ends shall terminate in flat surfaces, within 1.5 degrees of a right angle to axis of bars and shall be fitted within 3 degrees of full bearing after assembly.

2.4 DOWEL BAR ANCHORS/SPLICERS

A. Provide dowel bar anchors and threaded dowels designed to develop, both in tension and compression, 125% of the minimum ASTM specified yield strength of the dowel bars, as evidenced by published I.C.B.O. test reports. Unless otherwise indicated, anchors shall be furnished with ACI standard 90 degree hooks. Dowels shall be furnished by anchor supplier. The following dowel splicing systems are acceptable.
   1. Richmond Screw Anchor “Dowel Bar Splicer”
   2. Erico “Lenton Form Saver”
   3. Dayton Barsplice “Grip-Twist”

2.5 MECHANICAL SPLICES

A. Provide mechanical splices designed to develop, both in tension and compression, 125% of minimum ASTM yield strength of the smaller bar being coupled, as evidenced by published I.C.B.O test reports. The following bar splicing systems are acceptable.
   1. Erico “Cadweld C-Series”
   2. Erico “Lenton”
   3. Dayton Barsplice “Bar Grip”
   4. Dayton Barsplice “Grip Twist”

2.6 METAL ANCHORAGE AND EMBEDDED METAL ASSEMBLIES

A. Steel Shapes and Plates: Conform to ASTM A36, “Specification for Structural Steel”.

B. Headed Stud Anchors: Headed studs welded by full fusion process, as furnished by TRW Nelson Stud Welding Division.

C. Welding Electrodes: AWS 5.5, Series E70.

D. Welded Deformed Bar Anchors: Welded by full fusion process, as furnished by TRW Nelson Stud Welding Division.

E. All metal assemblies exposed to earth, weather or moisture, including exposure to a crawl space environment, shall be hot dip galvanized.

2.7 FABRICATION OF METAL ACCESSORIES AND EMBEDDED METAL ASSEMBLIES

A. Fabricate and assemble structural steel items in the shop. Shearing, flame cutting, and chipping shall be done carefully and accurately. Holes shall be cut, drilled, or punched at right angles to the surface of metal and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges. Welded construction shall conform to AISC “Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings,” and AWS D1.1. Welding shall be done by AWS certified welders.

B. Welding of deformed bar anchors and headed stud anchors shall be done by full fusion process equal to that of TRW Nelson Stud Welding Division of KSM Welding Services Division, Omark, Ind. A minimum of two headed studs shall be tested at start of each production period for proper quality control. Studs shall be capable of being bent 45 degrees without weld failure.

C. Welding of reinforcement shall be done in strict accordance with AWS requirements, using recommended preheat temperature and electrode for type of reinforcement being welded. Bars larger than No. 9 shall not be welded. Welding shall be performed subject to the observance and testing laboratory. Under no circumstances is ordinary reinforcing (ASTM A615) to be welded.

D. Coatings, where required, shall be applied after fabrication and prior to casting concrete.

PART 3 - EXECUTION

3.1 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.

3.2 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Provide minimum concrete covering for reinforcement as shown in the Structural General Notes.

G. Place bars to following tolerances:
   1. Clear distance to formed surfaces: Plus or minus ¼ inch.
   2. Minimum spacing between bars: Minus ¼ inch.
   3. Top bars in slabs and beams:
      a. Members 8 inches deep or less: Plus or minus ¼ inch.
      b. Members between 8 and 24 inches deep: Plus or minus ½ inch.
      c. Members more than 24 inches deep: Plus or minus 1 inch.
   4. Crosswise of members: Spaced evenly within 2 inches.
   5. Length of members: Plus or minus 2 inches.

H. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If moved more than one bar diameter, or enough to exceed above tolerances, resulting arrangement of bars subject to approval.

I. Support reinforcement and fasten together to prevent displacement by construction loads or placing concrete beyond tolerances indicated.

J. Unless permitted by Engineer, do not bend reinforcement after embedding in hardened concrete.

3.3 FIELD QUALITY CONTROL

A. Testing and Inspecting: See Section 01 45 23.

B. Inspections:
   1. Steel reinforcement placement.
   2. Steel reinforcement welding.

END OF SECTION 03 20 00

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Footings.
   2. Foundation walls.
   3. Slabs-on-grade.
   4. Concrete toppings.

B. Related Sections:
   1. Section 01 45 23 “Structural Testing and Inspection Services”.
   2. Section 03 20 00 "Concrete Forming and Accessories".
   3. Section 03 10 00 "Concrete Reinforcing".
   4. Section 03 05 80 “Under-slab Vapor Barrier – Retarder”.
   5. Section 31 63 29 “Drilled Concrete Piers and Shafts”.

1.3 REFERENCES

A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
   1. ACI 301 – Specification for Structural Concrete.
   2. ACI 302 – Guide for Concrete Floor Slab Construction.
   3. ACI 304 – Guide for Measuring, Mixing, Transporting and Placing Concrete.
   4. ACI 305 – Hot Weather Concreting.
   5. ACI 306 – Cold Weather Concreting.
   6. ACI 308 – Guide to Curing Concrete.
   7. ACI 309 – Guide for Consolidating Concrete.
   8. ACI 311 – ACI Manual for Concrete Inspection.
   9. ACI 318 – Building Code Requirements for Reinforced Concrete.
   10. ACI 347 – Guide to Concrete Formwork.
   11. ACI 207 – Mass Concrete.
   12. ACI 211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
   13. ACI 211.2 – Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
   14. ACI 212.3 – Chemical Admixture for Concrete.
   15. ACI 212.4 – Guide for the use of High Range Water Reducing Admixtures in Concrete.
   16. ACI 214 – Evaluation of Strength Test Results of Concrete.
   17. ACI 303 – Guide to Cast in Place Architectural Concrete Practice.
   18. Concrete Reinforcing Steel Institute, “Manual of Standard Practice”.

B. In the case of conflict between the Contract Documents and a referenced standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.4 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture include the following information. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. Each proposed mix design shall be accompanied by a complete standard deviation analysis based on at least 30 consecutive strength tests, or by three laboratory trial mixtures with confirmation tests.
2. Proportions of cement, fine, and coarse aggregate, and water.
3. Design strength.
4. Maximum slump.
5. Air Content.
6. Maximum water / cement ratio.
7. Maximum and minimum concrete temperature that is acceptable at time of placement for which the manufacturer can guarantee the strength of the concrete.
8. Type cement and aggregates.
9. Type and quantities of all admixtures.
10. Air dry density and splitting tensile strength for lightweight concrete determined in accordance with ASTM 330.
11. Type, color, and quantities of integral coloring compounds, where applicable.
12. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Refer Section 03 20 00.

D. Formwork Shop Drawings: Refer Section 03 10 00.

E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Architect.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Floor and slab treatments.
6. Bonding agents.
7. Adhesives.
8. Semi rigid joint filler.
9. Joint-filler strips.
10. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: See Section 01 45 23.
1. Contractor’s responsibility to testing laboratory.
a. Furnish all labor and materials as required to assist testing agency in obtaining, making and handling samples at the jobsite.
b. Advise the Owner’s Testing Laboratory sufficiently in advance of operations to allow adequate time for the assignment of testing personnel.
c. Furnish and maintain adequate facilities for proper curing of concrete test specimens on the project site in accordance with ASTM C31.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.

H. Preinstallation Conference: Conduct conference at Project site.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.

1.8 **DELIVERY, STORAGE, AND HANDLING**

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings, if any, on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. See Section 03 10 00.

2.2 STEEL REINFORCEMENT

A. See Section 03 20 00.

2.3 REINFORCEMENT ACCESSORIES

A. See Section 03 20 00.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   1. Portland Cement: ASTM C 150, Type I or Type I/II, gray. Supplement with the following:
      a. Fly Ash: ASTM C 618, Class F or C. Carbon content shall not exceed 3 percent by volume.
      b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years of satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
   1. Maximum Coarse-Aggregate Size: 1-1/2 inches, 1 inch, or 3/4 inch nominal as indicated on Drawings for specific uses.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.

D. Water: ASTM C 94 and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that contain not more than 0.05 percent water soluble chloride ions. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494, Type A.
   2. Retarding Admixture: ASTM C 494, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

C. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. ChemMasters.
      b. Davis Colors.
      c. Dayton Superior Corporation.
      d. Hoover Color Corporation.
      e. Lambert Corporation.
      f. QC Construction Products.
      g. Rockwood Pigments NA, Inc.
      h. Scofield, L. M. Company.
      i. Solomon Colors, Inc.
   2. Color: As selected by Architect from manufacturer's full range.

2.6 FIBER REINFORCEMENT

A. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1 to 2-1/4 inches long.
   1. Products: Subject to compliance with requirements, provide one of the following:

a. 3M; Scotchcast Polyolefin Fibers 2".
b. Euclid Chemical Company (The), an RPM company; Tuf-Strand SF.
c. FORTA Corporation; FORTA FERRO.
d. Grace Construction Products, W. R. Grace & Co.; Strux 90/40.
e. Nycon, Inc.; XL.
f. Propex Concrete Systems Corp.; Fibermesh 650.
g. Sika Corporation; Sika Fiber MS or MS10.

2.7 CONCRETE MIX DESIGNS

A. Selection of Proportions: Proportions of ingredients for concrete mixes shall be determined by a qualified concrete supplier in accordance with the requirements of ACI 301.

B. Required average strength above specified strength: Determination of required average strength above specified strength shall be based on the standard deviation record of the production facility in accordance with ACI 301. Calculation of standard deviation of compressive strength results shall be made in accordance with ACI 214. If a suitable record of strength tests is not available, proportions shall be selected on the basis of laboratory trial batches to produce an average strength greater than the strength f'c by the amount defined in ACI 301.

2.8 VAPOR RETARDERS

A. See Section 03 05 80.

2.9 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing No. 8 sieve.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Anti-Hydro International, Inc.; Emery.
b. Dayton Superior Corporation; Emery Tuff Non-Slip.
c. Lambert Corporation; EMAG-20.
d. L&M Construction Chemicals, Inc.; Grip It.
e. Metalcrete Industries; Metco Anti-Skid Aggregate.

B. Slip-Resistive Aluminum Granule Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of not less than 95 percent fused aluminum-oxide granules.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Anti-Hydro International, Inc.; A-H Alox.
b. BASF Construction Chemicals - Building Systems; Frictex NS.
c. L&M Construction Chemicals, Inc.; Grip It AO.

2.10 LIQUID FLOOR TREATMENTS

A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
1. Products: Subject to compliance with requirements, provide one of the following:
a. ChemMasters; Chemisil Plus.
b. ChemTec Int'l; ChemTec One.
c. Conspec by Dayton Superior; Intraseal.
d. Curecrete Distribution Inc.; Ashford Formula.
e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
f. Edoco by Dayton Superior; Titan Hard.
g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
h. Kaufman Products, Inc.; SureHard.
i. L&M Construction Chemicals, Inc.; Seal Hard.

j. Meadows, W. R., Inc.; LIQUI-HARD.
k. Metalcrete Industries; Floorsaver.
l. Nox-Crete Products Group; Duro-Nox.
m. Symons by Dayton Superior; Buff Hard.
n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.

C. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Advanced Floor Products; Retro-Plate 99.
b. L&M Construction Chemicals, Inc.; FGS Hardener Plus.
c. QuestMark, a division of CentiMark Corporation; DiamondQuest Densifying Impregnator Application.

2.11 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
b. BASF Construction Chemicals - Building Systems; Confilm.
c. ChemMasters; SprayFilm.
d. Conspec by Dayton Superior; Aquafilm.
e. Dayton Superior Corporation; Sure Film (J-74).
f. Edoco by Dayton Superior; BurkeFilm.
g. Euclid Chemical Company (The), an RPM company; Eucobar.
h. Kaufman Products, Inc.; Vapor-Aid.
i. Lambert Corporation; LAMBCO Skin.
j. L&M Construction Chemicals, Inc.; E-CON.
k. Meadows, W. R., Inc.; EVAPRE.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group; MONOFILM.
n. Sika Corporation; SikaFilm.
o. SpecChem, LLC; Spec Film.
p. Symons by Dayton Superior; Finishing Aid.
q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
r. Unitex; PRO-FILM.
s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.
E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. BASF Construction Chemicals - Building Systems; Kure 200.
c. ChemMasters; Safe-Cure Clear.
d. Conspec by Dayton Superior; W.B. Resin Cure.
e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
f. Edoco by Dayton Superior; Res X Cure WB.
g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
h. Kaufman Products, Inc.; Thinfilm 420.
i. Lambert Corporation; AQUA KURE - CLEAR.
j. L&M Construction Chemicals, Inc.; L&M Cure R.
k. Meadows, W. R., Inc.; 1100-CLEAR.
l. Nox-Crete Products Group; Resin Cure E.
m. Right Pointe; Clear Water Resin.
n. SpecChem, LLC; Spec Rez Clear.
o. Symons by Dayton Superior; Resi-Chem Clear.
p. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
1. Products: Subject to compliance with requirements, provide one of the following:
a. BASF Construction Chemicals - Building Systems; Kure 1315.
b. ChemMasters; Polyseal WB.
c. Conspec by Dayton Superior; Sealcure 1315 WB.
d. Edoco by Dayton Superior; Cureseal 1315 WB.
e. Euclid Chemical Company (The), an RPM company; Super Diamond Clear VOX; LusterSeal WB 300.
f. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
g. Lambert Corporation; UV Safe Seal.
h. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
i. Meadows, W. R., Inc.; Vocomp-30.
j. Metalcrete Industries; Metcure 30.
k. Right Pointe; Right Sheen WB30.
l. Symons by Dayton Superior; Cure & Seal 31 Percent E.
m. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.
2. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.12 RELATED MATERIALS

A. Expansion and Isolation Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.13 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

2.14 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, as indicated in Structural General Notes.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.15 NON-SHRINK GROUT

A. Grout shall be prepackaged, non metallic, and non gaseous. It shall be non-shrink when tested in accordance with ASTM-C1107 Grade B or C at a fluid consistency (flow cone) of 20 to 30 seconds. Thirty-minute-old grout shall flow through the flow cone after slight agitation, in temperatures of 40 degrees to 90 degrees Fahrenheit. Grout shall be bleed free and attain 7,500 psi compressive strength in 28 days at fluid consistency. Certified independent test data required. Approved products include the following:
1. “Euco NS” by Euclid Chemical Company
2. “Masterflow 713” by Master Builders.

2.16 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Proportion normal-weight concrete mixture as indicated in Structural General Notes:

2.17 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.18 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. See Section 03 10 00.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   2. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. See Section 03 10 00.

3.4 SHORES AND RESHORES

A. See Section 03 10 00.

3.5 VAPOR RETARDERS/BARRIERS

A. See Section 03 05 80.

3.6 STEEL REINFORCEMENT

A. See Section 03 20 00

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants are specified or otherwise indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Do not permit concrete to drop freely any distance greater than 10’-0” for concrete containing a high range water reducing admixture or 5’-0” for other concrete. Provide chute or tremie to place concrete where longer drops are necessary. Do not place concrete into excavations with standing water. If place of deposit cannot be pumped dry, pour concrete through a tremie with its outlet near the bottom of the place of deposit.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleed water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

G. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

H. Hot-Weather Placement: Comply with ACI 305 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. See Section 03 10 00.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
   1. Apply scratch finish to surfaces indicated and/or to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated and/or to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces indicated and/or exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish surfaces according to ASTM E 1155, for a randomly trafficked floor surface.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated or where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
   1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
   1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistivegranules over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
   2. After broadcasting and tamping, apply float finish.
   3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive granules.

3.11 CONCRETE FLOOR FINISH TOLERANCES

A. Interior Finish Floor surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155, "Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System." The following values apply before removal of shores. Levelness values F(L) do not apply to intentionally sloped or cambered areas, nor to slabs poured on metal deck or precast concrete.
   1. Exposed, vinyl tiled, or thin-set tiled floors: Specified overall values of flatness, Ff =35; and levelness, Fl =25; with minimum local values of flatness, Ff =24; and levelness, Fl =17.
   2. Carpeted floors, floors under concrete toppings, thickset tile and terrazzo: Specified overall values of flatness, Ff =25; and levelness, Fl = 20; with minimum local values of flatness, Ff =17; and levelness, Fl =15.

B. Floor Elevation Tolerance Envelope:
   1. The acceptable tolerance envelope for absolute elevation of any point on the slab surface, with respect to the elevation shown on the Drawings, is as follows:
      a. Slab-on-Grade, or Slab-on-Void Construction: +/- 3/4"
      b. Top surfaces of formed slabs measured prior to removal of supporting shores: +/- 3/4"

c. Top surfaces of all other slabs: +/- 3/4"
d. Slabs specified to slope shall have a tolerance from the specified slope of 3/8" in 10'-0" at any point, up to 3/4" from theoretical elevation at any point.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturers written instructions.
1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than 28 days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Polished Concrete Floor Treatment: Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
2. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
3. Continue polishing with progressively finer grit diamond polishing pads to gloss level to match approved mockup.
4. Control and dispose of waste products produced by grinding and polishing operations.
5. Neutralize and clean polished floor surfaces.

C. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.15 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least six month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.17 FIELD QUALITY CONTROL

A. Testing and Inspecting: See Section 01 45 23.
1. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
2. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03 30 00

SECTION 03 54 16 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes hydraulic-cement-based, polymer-modified, self-leveling underlayment for application below interior floor coverings.
   1. Broad scope leveling of existing and new concrete floors scheduled to have new flooring applied.
   2. Transitioning leveling of floors to create uniform level height between different flooring materials.

1.3 UNIT PRICES

A. Work of this Section is affected by underlayment unit price.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For qualified Installer.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: Signed by manufacturers of underlayment and floor-covering systems certifying that products are compatible.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
   1. Place hydraulic-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

1.9 COORDINATION

A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 HYDRAULIC-CEMENT-BASED UNDERLAYMENTS

A. Underlayment: Hydraulic-cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thickness of 1/4 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Products: Subject to compliance with requirements, provide one of the following :
      a. Ardex; K-15 Self-Leveling Underlayment Concrete.
      b. Dayton Superior Corporation; LeveLayer.
      c. MAPEI Corporation; Ultraplan Easy .
      d. Maxxon Corporation; Level-Right.
      e. H.B. Fuller company; TEC Smooth Start TEC EZ Level.
      f. USG Corporation; Levelrock.
   2. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
   3. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.
   4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer.
   1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F.

D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
   1. Primer shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance.
   1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.
   1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
   2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
   1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 85 percent relative humidity level measurement, or as recommended by hydraulic cement underlayment manufacturer.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.
1. Apply a final layer without aggregate to product surface.
2. Feather edges to match adjacent floor elevations.

D. Transitioning Leveling: Apply underlayment as required to create uniform level height between different flooring materials, where transition strips are not indicated on Drawings. Leveling shall extend out as needed to conform to ADA and TAS requirements.

E. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

F. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

G. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03 54 16

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Concrete masonry units.
2. Brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Steel lintels.
8. Embedded flashing.
9. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under this Section:
1. Cavity-wall insulation.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Control and Expansion Joint Locations: Provide proposed location of all control or expansion joints.
3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Indicate elevations of reinforced walls.
4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Verification: For each type and color of the following:
1. Brick, in the form of straps of five or more bricks.

1.6 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:
1. Masonry units.
a. Include data on material properties and material test reports substantiating compliance with requirements.
b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include test report for efflorescence according to ASTM C 67.
d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

B. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

C. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups for each type of exposed unit masonry construction in sizes approximately 8-feet inches long by 8-feet high by full thickness, including face and backup wythes and accessories.
   a. Include a sealant-filled joint at least 16 inches long in each exterior wall mockup.
   b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
   c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
   d. Include studs, sheathing, and veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
3. Protect accepted mockups from the elements with weather-resistant membrane.
4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
   a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
   b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
   2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
   1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

2.2 MASONRY UNITS, GENERAL

A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

C. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.3 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated on drawings.
   1. Provide square-edged units for outside corners unless otherwise indicated.

B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
   1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

a. Products: Subject to compliance with requirements, provide one of the following:
   1) ACM Chemistries; RainBloc.
   2) Euclid Chemical Company; Eucon Blocktite.
   3) Master Builder Solutions; MasterPel.

C. CMUs: ASTM C 90.
1. Density Classification: Medium weight .
2. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
3. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Featherlite Building Products.
   b. Texas Building Products, Inc.
   c. Revels Block & Brick Co., Inc.
   d. Best Block Construction Materials

2.4 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Acme Brick Tile & Stone
2. Endicott Brick
3. General Shale Brick
4. Glen-Gery
5. Kansas Brick and Tile
6. Meridian Brick
7. Summit Brick.

C. Basis of Design: Refer to Architect’s Master Schedule.

D. Face Brick: Facing brick complying with ASTM C 216.
1. Grade: Refer to Architect’s Master Schedule SW.
2. Type: Refer to Architect’s Master Schedule FBX.
3. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
4. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
5. Size (Actual Dimensions): As scheduled.
6. Application: Use where brick is exposed unless otherwise indicated.
7. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
8. Color and Texture: Refer to Architect’s Master Schedule.

2.5 MORTAR AND GROUT MATERIALS

A. Pre-Blended Mortar: Portland Cement Lime & Sand Masonry Mortar is a dry pre-blended mortar mix containing Portland cement, hydrated lime and dried masonry sand color mortar pigments with dry integral water-repellent mortar admixture formulated for superior bond, workability and board life. Comply with ASTM C 1714. Masonry Cement products are not acceptable.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AHI Supply
   b. Amerimix
   c. SpecMix
2. Water Repellent: Dry Integral Water-Repellent Mortar Admixture
3. Colored Mortar Pigments:

a. Natural and synthetic, milled, blended iron oxides, complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
b. Carbon added for darker colors shall not exceed 4 percent.
c. Produce uniform and consistent color.
d. Inert, stable to atmospheric conditions, sunfast, weather resistant, alkali resistant, water insoluble, lime proof and nonbleeding.
e. Free of deleterious fillers and extenders.
f. Color: Custom color.

B. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Euclid Chemical Company (The); Accelguard 80.
b. GCP Applied Technologies; Morset.
c. Master Builders Solutions; MasterSet FP 20.

C. Water: Clean Potable.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Mix to match Architect's sample.
3. Application: Use pigmented mortar for exposed mortar joints with the following units:
a. Face brick.

E. Mortar: Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
4. For interior non-load-bearing partitions, Type O may be used instead of Type N.

F. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

2.6 REINFORCEMENT

A. Refer to Structural Drawings and Specifications for reinforcement requirements.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
1. Products: Subject to compliance with requirements, provide one of the following]:
a. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
b. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
c. Wire-Bond, Figure 8 Rebar Positioners.

2.7 TIES AND ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hohmann & Barnard, Inc.
2. Wire-Bond

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.

C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch- thick, steel sheet, galvanized after fabrication .
      a. 0.064-inch- thick, galvanized sheet may be used at interior walls unless otherwise indicated.
   2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 3/16-inch -diameter, hot-dip galvanized steel wire.

D. Adjustable Masonry-Veneer Anchors:
   1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
      a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
   2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Basis of Design: Hohmann & Barnard, Inc.; HB-213 with 2X-Hook
      b. Material: Hot Dip Galvanized.
   3. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
      a. Final fastener selection to be coordinated with anchor manufacturer to meet design performance requirements.

2.8 LINTELS

A. Fabricate steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

D. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

2.9 EMBEDDED FLASHING MATERIALS

A. Metal Though-Wall Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
   1. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
      a. Cheney Flashing Company
      b. Hohmann & Barnard, Inc.
      c. Wire-Bond
   2. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 26 gauge.
   3. Fabricate continuous flashings in sections 10-feet long minimum, but not exceeding 12 ft. Provide splice plates at joints of formed, smooth metal flashing.
   4. Fabricate through-wall flashing as indicated.
   5. Solder metal items at corners.

B. Concealed Metal Drip Edges: Prefabricated drip edge; designed to extend 1-1/2 inches into wall and flush, with outer edge hemmed 3/16-inch minimum as required.
   1. 304 Stainless Steel, 26 gauge.

C. Provide width of elastic flashing sufficient to overlap the drip edge a minimum of 1-inch and extend through the cavity and up the exterior surface of the backup a minimum of 8-inches.

D. Preformed Corners: Provide manufacturer’s preformed inside and outside corners to facilitate installation and ensure consistent installation.

E. Application: Unless otherwise indicated, use the following:
   1. Where flashing is indicated to receive counterflashing, use metal flashing.
   2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.

3. Where flashing is partly exposed and is indicated to terminate at the wall face, use flexible flashing with a metal drip edge.
4. Where flashing is fully concealed, use flexible flashing.

F. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high-density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing pans have integral weep spouts that are designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging with mortar.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Mortar Net USA, Ltd.; Blok-Flash.

G. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from urethane or PVC.

B. Weep/Vent Products: Use the following unless otherwise indicated:
1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
a. Products: Subject to compliance with requirements, provide one of the following:
1) Advanced Building Products Inc.; Mortar Maze weep vent.
2) Heckmann Building Products Inc.; No. 85 Cell Vent.
3) Hohmann & Barnard, Inc.; Quadro-Vent.
4) Wire-Bond; #3601 Cell Vent.

C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Advanced Building Products Inc.; Mortar Break.
b. Heckmann Building Products, Inc.; #84 Weep-Thru Mortar Deflector.
c. Mortar Net USA, Ltd.; Wall Defender
d. Hohmann & Barnard, Inc; Mortar Trap
e. Wire-Bond; Cavity Net.
2. Provide one of the following configurations:
a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.

2.11 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. EaCoChem.
b. Prosoco, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:
1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond or bond pattern indicated on Drawings if different; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
   3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
   4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 46 "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

A. Lay cored brick or CMUs as follows:
   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
   3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
   4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Set trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
   1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
   2. Allow cleaned surfaces to dry before setting.
   3. Wet joint surfaces thoroughly before applying mortar.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

A. Stack bond: Provide horizontal reinforcing at all stack bond locations to provide proper support

B. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
   3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

C. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

D. Provide continuity at wall intersections by using prefabricated T-shaped units.

E. Provide continuity at corners by using prefabricated L-shaped units.

F. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
   1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
   2. Embed in masonry joints.
   3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
   4. Space anchors not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.
   5. Brick anchors must be embedded at least 1-1/2-inch into the brick veneer with a minimum motar cover of 5/8 in. to the outside face of the wall.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:
   1. Install preformed control-joint gaskets designed to fit standard sash block.
   2. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick as follows:
   1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
   2. Build flanges of factory-fabricated, expansion-joint units into masonry.
   3. Build in compressible joint fillers where indicated.
   4. Form open joint full depth of brick wythe and of width indicated, but not less than[3/8 inch1/2 inch for installation of sealant and backer rod specified in Section 07 92 00 "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 92 00 "Joint Sealants," but not less than 3/8 inch.
   1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 LINTELS

A. Install galvanized steel lintels and paint.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 FLASHING, WEEP HOLES AND CAVITY DRAINAGE

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated

B. Install flashing as follows unless otherwise indicated:
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
   2. At masonry-veneer walls, extend thru wall flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge secured with termination bar to the backup wall.
   3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
   4. Interlock end joints of sheet metal flashing by overlapping not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated.
   5. Install metal drip edges beneath flexible flashing in full bed of sealant at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
   1. Use specified weep/vent products to form weep holes.
   2. Space weep holes 24 inches o.c. unless otherwise indicated.

F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

G. Install vents in head joints in exterior wythes at 24 inch spacing.

3.11 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   2. Limit height of vertical grout pours to not more than 60 inches.

3.12 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."
   1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
   2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
   3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

J. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste.
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

SECTION 05 05 13 – SHOP-APPLIED COATINGS FOR METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Sections Includes: Metal Finishes (Drawing Designation, MF)
   1. Anodizing.
   2. Baked enamel coating.
   3. PVDF coating.
   4. Powder coated finish.
   5. Stainless steel finish.

1.2 SUBMITTALS

A. General: Submit submittals of this section simultaneously with submittals of sections with components with finishes specified in this section.

B. Product Data: Submit following:
   1. Product data for each coating.
   2. Color charts for finish indicating manufacturer's colors available for selection.
   3. Include sample of warranty customized for this Project.

PART 2 - PRODUCTS

2.1 PREPARATION

A. Sheet Steel to be Coated:
   1. Mechanical Finishes: Complete mechanical finishes of flat sheet metal surfaces before fabrication. After fabrication, finish joints, bends, abrasions, and other surface blemishes to match sheet finish. Protect mechanical finishes on exposed surfaces from damage by application of adhesive paper or other temporary protective covering, prior to shipment.
   2. Surface Preparation: Solvent-clean surfaces in compliance with SSPC-SP1 to remove dirt, oil, grease and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel in compliance with SSPC-SP5 (White Metal Blast Cleaning) or SSPC-SP8 (Pickling).
   3. Chemical Pretreatment: Apply hot phosphate surface treatment to uncoated steel sheet to comply with SSPC-PT4.
   4. Comply with SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

B. Protective Coatings: Do not use coatings containing lead.
   1. Primed Carbon Steel: Touch-up with primer.
   2. Galvanized Steel: Touch-up with primer.

C. Metal Patching Compound:
   1. Two-part epoxy and metal filler, putty grade, composed of metal alloy blended with high molecular weight polymer.
   2. Match base metal of putty to item being repaired.
   3. Use steel-based alloy for repairing cast iron.
   4. Machinable after curing.
   5. Paste consistency: Negligible slump at 1 inch thickness or less.
   6. Shrinkage: Show no evidence of measurable shrinkage from plastic state to hardened state.
   7. Acceptable Manufacturers and Products:
      a. Belzona, Super Metal 1111. Use only on steel or cast-iron items.
      b. Bondo, Bondo/Mar-Hide.

2.2 SHOP FINISHING

A. General: Apply finishes in factory after products are assembled.

B. Protect finish with factory applied protective covering prior to shipment.

1. Remove scratches and blemishes from exposed surfaces which will be visible after completing finishing process.
2. Finish accessories such as trim, flashing, screens, blank-off panels, and fasteners to match assembly.

2.3 ANODIZING

A. Anodizing: Comply with AAMA 611.

B. Clear Anodized Finish:
1. Exterior Applications: AAMA 611, Class I, 0.018 mm or thicker.
2. Interior Applications: AAMA 611, Class II, 0.010 mm or thicker.

C. Color Anodic Finish:
1. Exterior Applications: AAMA 611, Class I, 0.018 mm or thicker
2. Interior Applications: AAMA 611, Class II, 0.010 mm or thicker

2.4 BAKED ENAMEL COATING

A. Baked Enamel Finish System: Includes dipped, electrostatic, powder coat, and other forms of baked enamel shop finishing.
1. Galvanized Steel Surfaces: Cleaned and phosphate conversion coated prior to application of 0.2 mil dry film thickness rust-inhibitive prime coat.
2. Aluminum Surfaces: Cleaned, etched and given chromate conversion pre-treatment prior to application 0.2 mil dry film thickness of prime coat.
3. Finish Coat: Manufacturer’s standard thermo-cured acrylic, polyester or alkyd enamel, 1.0 mil minimum dry film thickness.
4. Total Coating Dry Film Thickness: 1.5 mils.

2.5 FLUOROPOLYMER (PVDF) COATING

A. Acceptable Manufacturers:
1. Akzo Nobel Coatings, Inc.
2. Arkema.
3. Pittsburgh Paints Company.
4. Sherwin Williams

B. Fluoropolymer (PVDF) Coating: AAMA 2605.
1. Resin: 70 percent polyvinylidene fluoride (PVDF).
2. Substrate, Aluminum: Cleaned and chrome phosphate pre-treated.
3. Primer: Manufacturer’s standard epoxy or acrylic coating.
   a. Dry Film Thickness: Minimum 0.20 mil.
4. Topcoat: PVDF, Dry Film Thickness:
   a. Coil: 0.80 mil.
   b. Extrusion: 1.0 mil.

2.6 POWDER COATED FINISH

A. Shop-Applied Powder Coated Finish: Fabricator’s standard.
1. Clean and phosphatize surfaces prior to application of coating.
2. Apply chrome pretreatment to aluminum surfaces to receive PVDF finish.
3. Apply powder coat finish system for sheet steel immediately following surface preparation and chemical pretreatment.
4. Comply with paint manufacturer's recommendations for application and baking to achieve minimum recommended dry film thickness.

2.7 STAINLESS STEEL FINISH

A. Stainless Steel Finishes: ASTM A480.
1. Protect finishes with factory applied adhesive backed paper covering.
2. Unless otherwise Scheduled or Indicated: No. 4 - General Purpose Polished, vertical grain.

2.8 MASTER SCHEDULE COLOR OR FINISHES
1. Color: For all color or finishes, refer to Architect’s Master Schedule.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Structural steel.
2. Prefabricated building columns.

B. Related Sections:
1. Section 01 45 23 "Testing and Inspection Services".
2. Section 05 31 13 "Steel Floor Decking".
3. Section 05 31 23 "Steel Roof Decking".
4. Section 05 50 00 "Metal Fabrications".

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:
1. Shapes included in ASTM A 6 with flanges thicker than 1 1/2 inches.
2. Welded built-up members with plates thicker than 2 inches.
3. Column base plates thicker than 2 inches.

D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 REFERENCES

A. Comply with applicable provisions of the following specifications and documents: The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise
1. AISC "Code of Standard Practice for Steel Buildings and Bridges”.
2. AISC "Specification for Structural Steel Buildings," including the "Commentary" and the Supplements thereto, as issued.
3. AISC "Specification for Architecturally Exposed Structural Steel”.
4. AISC's "Seismic Provisions for Structural Steel Buildings”.
5. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use”.
6. AWS D1.1 Structural Welding Code.
7. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".

8. Research Council on Structural Connections' (RCSC) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".
9. SSPC (Steel Structures Painting Council), Painting Manuals, Volumes 1 and 2.
10. UL Fire Resistance Directory.

B. In the case of conflict between the Contract Documents and a reference standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.5 PERFORMANCE REQUIREMENTS

A. Delegated Design: Prepare submittal documents including connection design calculations and drawings signed and sealed by registered design professional, licensed in state where project is located, employed by the steel fabricator.

B. Design all structural steel framing connections complying with specified performance:
1. Load Capacity: Resist loads indicated on drawings or resist full capacity of supported framing member if reaction not indicated. Account for connection and member loads and eccentricities.
   a. Request additional design criteria when necessary to complete connection design.
2. Configuration: Design and detail all connections for each member size, steel grade and connection type to resist the loads and reactions indicated on the drawings or specified herein. Use details consistent with details shown on drawings, supplementing where necessary. The details shown on drawings are conceptual and do not indicate the required weld sizes or number of bolts unless specifically noted. Use rational engineering design and standard practice in detailing, accounting for all loads and eccentricities in both the connection and the members. Promptly notify the design professional in charge of any location where the connection design criteria is not clearly indicated. The design of all connections is subject to the review and acceptance of the design professional in charge. Submit structural calculations prepared and sealed by a qualified engineer registered in the state where the project is located. Submit calculations for review before preparation of detail drawings.

C. Construction: System as indicated on Drawings.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.
1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Indicate locations and dimensions of protected zones.
7. Identify demand critical welds.
8. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. At full penetration welds, Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

1.7 INFORMATIONAL SUBMITTALS

A. Submit the following informational submittals:
1. Qualification Data: For qualified installer, fabricator, and testing agency.
2. Welding certificates.
3. Mill test reports for structural steel, including chemical and physical properties.

4. Product Test Reports: For the following:
   a. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   b. Direct-tension indicators.
   c. Tension-control, high-strength bolt-nut-washer assemblies.
   d. Shear stud connectors.
   e. Shop primers.
5. Source quality-control reports.

1.8 **QUALITY ASSURANCE**

A. Fabricator Qualifications: A qualified fabricator with a minimum of (5) years of experience that participates in the AISC Quality Certification Program for Category I or higher structures and is designated and is designated an AISC-Certified Plant, Category STD. An otherwise qualified fabricator who is not a member of the AISC Quality Certification Program will be accepted if satisfactory evidence of qualifications is submitted prior to award of Contract. For non-certified fabricators, Contractor shall submit a resume describing plant size, equipment quality control procedures and personnel, and experience on comparable work in the last five (5) years.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1, P2, or P3 as applicable for exposure or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303.
   2. AISC 341 and AISC 341s1.
   3. AISC 360.
   4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

F. Preinstallation Conference: Conduct conference at Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.10 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
1. W-Shapes: 60 percent.
2. Channels, Angles, M, S-Shapes: 60 percent.
3. Plate and Bar: 25 percent.
4. Cold-Formed Hollow Structural Sections: 25 percent.
5. Steel Pipe: 25 percent.
6. All Other Steel Materials: 25 percent.

B. W-Shapes: Refer Structural General Notes.

C. Channels, Angles, M, S-Shapes: Refer Structural General Notes.

D. Plate and Bar: Refer Structural General Notes.

E. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588, Grade 50.

F. Cold-Formed Hollow Structural Sections: Refer Structural General Notes.

G. Steel Pipe: Refer Structural General Notes.
1. Weight Class: See Plans.
2. Finish: Black except where indicated to be galvanized.

H. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts.
1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. Zinc-Coated High-Strength Bolts, Nuts, and Washers (All bolts located in Crawl Space): ASTM A 325, Type 1, heavy-hex steel structural bolts.
1. Finish: Hot-dip or mechanically deposited zinc coating.
2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
1. Finish: Plain or Mechanically deposited zinc coating, where required.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

E. Unheaded Anchor Rods: ASTM F 1554, See Anchor Bolt Schedule on Drawings for Grade.
1. Configuration: Straight.
2. Nuts: ASTM A 563 heavy-hex carbon steel.
3. Plate Washers: ASTM A 36 carbon steel.
4. Washers: ASTM F 436, Type 1, hardened carbon steel.
5. Finish:
   a. General Condition – Plain
   b. Crawl Space - Hot-dip zinc coating, ASTM A 153, Class C.

F. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

G. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

H. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

I. Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Amscot Structural Products Corp.
      b. Fluorocarbon Company Limited.
      c. R.J. Watson Bridge & Structural Engineered Systems.
      d. Seismic Energy Products, L.P.
   2. Mating Surfaces: PTFE and PTFE or mirror-finished stainless steel.
   3. Coefficient of Friction: Not more than 0.05.
   4. Design Load: Not less than 5,000 psi .
   5. Total Movement Capability: 2 inches.

2.3 PRIMER

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Primer (General): Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

C. Primer (Crawl Space Steel): Tnemec Perimeprime Series 394.

D. Galvanizing Repair Paint: SSPC-Paint 20.

2.4 GROUT

A. Refer Section 03 30 00.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
   4. Mark and match-mark materials for field assembly.
   5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in final approved Shop Drawings.
   1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
   2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other effects.
   3. Camber structural steel members where indicated. The camber specified is the camber that is measured in the field with the beam on its side so that the beam weight has no effect. During shipment and handling, cambered members shall be supported in a way that will not result in loss of camber.
   4. Camber tolerance
      a. Beams 50 feet and less; plus or minus 1/2 inch.
      b. Beams greater than 50 feet; plus or minus 1/2 inch, except tolerance can be increased 1/8 inch for each 10 feet or fraction thereof in excess of 50 feet.
      c. Contact engineer for members outside specified camber tolerance. Provide engineer with a list of beam locations and actual measured camber amounts. Submit an engineered shoring plan, if requested, that will allow the beam to deflect to the horizontal position after concrete placement without overloading the framing below.

5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

H. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on approved shop drawings.
1. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.
2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes by burning.

I. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces. Base plates hole sizes for anchor bolts may be oversized to facilitate erection:
1. Bolts 3/4inch to 7/8 inch diameter: 1/2 inch oversize.
2. Bolts 1 inch to 1 1/2 inch diameter: 3/4 inch oversize.
3. Bolts over 1 3/4 inch diameter: 1 inch oversize.

J. Base Plate Washers: Sizes shall be as follows:
1. 3/4 inch diameter Bolts: 2 inch diameter x 1/4 inch thick
2. 7/8 inch diameter Bolts: 2 1/2 inch diameter x 5/16 inch thick
3. 1 inch diameter Bolts: 3 inch diameter x 3/8 inch thick
4. 1 1/4 inch diameter Bolts: 3 inch diameter x 1/2 inch thick
5. 1 1/2 inch diameter Bolts: 3 1/2 inch diameter x 1/2 inch thick
6. 1 3/4 inch diameter Bolts: 4 inch diameter x 5/8 inch thick
7. 2 inch diameter Bolts: 5 inch diameter x 3/4 inch thick

K. Architecturally Exposed Structural Steel (AESS): Fabricate with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.
1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
2. Comply with fabrication requirements, including tolerance limits, of AISC's "Specification for Architecturally Exposed Structural Steel" for architecturally exposed structural steel.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened, Pretensioned, or Slip critical as required or indicated on Drawings.

B. Weld Connections: Comply with AWS D1.1 and AWS D1.8, where required, for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:
1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.

4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing) excluding crawl space steel. Crawl space steel shall be primed regardless of whether it is to receive fireproofing.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 2, "Hand Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

D. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

E. Crawl space steel to be primed to a DFT between 2.5 and 3.5 mils.

F. Painting: Prepare steel and apply a one-coat, non-asphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels and shelf angles attached to structural steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Refer Section 01 45 23.
1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations, to elevations indicated, and according to AISC 303 and AISC 360.

B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow it to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened, Pretensioned, or Slip critical as indicated on Drawings.

B. Weld Connections: Comply with AWS D1.1 and AWS D1.8 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
   2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
   3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: See Section 01 45 23.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 05 12 00

SECTION 05 21 00

STEEL OPEN WEB JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. K-series steel joists.
2. KCS-type K-series steel joists.
3. K-series steel joist substitutes.
4. Joist accessories.
   a. Extended ends.
   b. Ceiling extensions.
   c. Bearing plates.
   d. Bridging.
   e. Side wall anchors.

B. Related Requirements:
1. Section 03 30 00 "Cast-in-Place Concrete".
2. Section 01 45 23 “Testing and Inspection Services”
3. Section 04 20 00 "Unit Masonry".
4. Section 05 12 00 "Structural Steel Framing".
5. Section 05 31 13 “Steel Floor Decking”.
6. Section 05 31 23 “Steel Roof Decking”.

1.3 REFERENCES

A. Comply with applicable provisions of the following specifications and documents. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
1. AWS D1.1 Structural Welding Code
2. SJI “Standard Specification Load Tables and Weight Tables for Steel Joists and Joist Girders”.
3. SDI “Design Manual for Composite Decks, Form Decks, Roof Decks, Cellular Metal Floor Deck with Electrical Distribution”.
4. SSPC Steel Structures Painting Council Painting Manual.
5. UL Fire Resistance Directory.
6. ICBO Product Evaluation Reports.
7. FM Roof Assembly Classifications.

B. In the case of conflict between the Contract Documents and a reference standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.4 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support non-uniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:
1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
3. Indicate locations and details of bearing plates to be embedded in other construction.
4. Shop drawings containing special joists shall be submitted with a design load summary for each special joist design. Load summary will be reviewed and returned with the joist submittal. Shop drawings containing special joists submitted without the specified load summary will be returned unchecked as an incomplete submittal. Shop drawings containing special joists shall be signed and sealed by the qualified professional engineer responsible for the design of the joists.

1.6 INFORMATIONAL SUBMITTALS

A. Submit the following informational submittals:
1. Qualification Data: For manufacturer.
2. Welding certificates.
3. Manufacturer certificates.
4. Mill Certificates: For each type of bolt.
5. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.9 SEQUENCING

A. Deliver steel bearing plates to be built into cast-in-place concrete and or masonry construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
1. Use ASD; data are given at service-load level.
2. Design special joists to withstand design loads with live-load deflections no greater than the following:
a. Floor Joists: Vertical deflection of 1/360 of the span.
b. Roof Joists: Vertical deflection of 1/360 of the span.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

2.2 MATERIALS

A. Steel: Comply with SJI's "Specifications" for chord and web members.

2.3 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
   1. Joist Type: K-series steel joists and KCS-type K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Top-Chord Extensions and Extended Ends: Provide top chord extension or extended ends where shown on plans. Design for load indicated on plans.

E. Camber joists according to SJI's Specifications unless noted otherwise.

F. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 PRIMERS

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.5 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" and "Standard Specifications for Composite Steel Joists, CJ-Series" in "Standard Specifications for Composite Steel Joists, Weight Tables and Bridging Tables, Code of Standard Practice" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Shop prime paint for interior exposure or Hot-dip zinc coat according to ASTM A 123/A 123M for exterior or weather exposure.

C. Furnish ceiling extensions (where indicated), either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.

D. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
   1. Finish: Plain, uncoated.

E. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
   1. Finish: Plain.

F. Welding Electrodes: Comply with AWS standards.

G. Galvanizing Repair Paint: ASTM A 780.

H. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.6 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.

C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1.5 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications", "Standard Specifications for Composite Steel Joists, CJ-Series" in "Standard Specifications for Composite Steel Joists, Weight Tables and Bridging Tables, Code of Standard Practice," joist manufacturer's written recommendations, and requirements in this Section.
1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field weld joists to supporting steel bearing plates and framework as indicated on Drawings. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance, and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using high-strength structural bolts as indicated on Drawings. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: See Section 01 45 23.

3.4 REPAIR AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
   1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
   2. Apply a compatible primer of same type as primer used on adjacent surfaces.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 21 00

SECTION 05 31 23

STEEL ROOF DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Roof deck.
2. Noncomposite vented roof deck.

B. Related Requirements:
1. Section 01 45 23 “Structural Testing and Inspection Services”
2. Section 05 12 00 "Structural Steel Framing".
3. Section 05 50 00 "Metal Fabrications".

1.3 REFERENCES

A. Comply with applicable provisions of the following specifications and documents. The latest adopted edition of all standard referenced in this section shall apply, unless noted otherwise.
1. AWS D1.1 – Structural Welding Code
2. AWS D1.3 – Structural Welding Code – Sheet Steel
3. SDI – Design Manual
4. SSPC – Painting Manual
5. UL – Fire Resistance Directory
6. ICBO – Product Evaluation Reports
7. FM – Roof Assembly Classifications

B. In the case of conflict between the Contract Documents and a referenced standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:
1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
1. Power-actuated mechanical fasteners.
2. Acoustical roof deck.

D. Evaluation Reports: For steel deck.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Refer Section 01 45 23.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
   1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ASC Profiles, Inc.; a Blue Scope Steel company.
   2. Canam United States; Canam Group Inc.
   3. CMC Joist & Deck.
   4. Consolidated Systems, Inc.; Metal Dek Group.
   5. Cordeck.
   6. DACS, Inc.
   7. Epic Metals Corporation.
   8. Marlyn Steel Decks, Inc.
   9. New Millennium Building Systems, LLC.
   10. Nucor Corp.; Vulcraft Group.
   11. Roof Deck, Inc.
   12. Valley Joist; Subsidiary of EBSCO Industries, Inc.
   13. Verco Manufacturing Co.
   14. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
   1. Prime-Painted Steel Sheet: ASTM A 1008, Structural Steel (SS), Grade 40 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
      a. Color: Manufacturer's standard.
   2. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 40, G90 zinc coating.
   3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 40, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
      a. Color: Manufacturer's standard.
   4. Deck Profile: As indicated on plan.
   5. Profile Depth: As indicated on plan.
   6. Design Uncoated-Steel Thickness: As indicated in Structural General Notes.
   7. Span Condition: Triple span or more.
   8. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 NONCOMPOSITE VENTED ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ASC Profiles, Inc.; a Blue Scope Steel company.
   2. Canam United States; Canam Group Inc.
   3. CMC Joist & Deck.
   4. Consolidated Systems, Inc.; Metal Dek Group.
   5. Marlyn Steel Decks, Inc.
   6. New Millennium Building Systems, LLC.
   7. Nucor Corp.; Vulcraft Group.
   8. Roof Deck, Inc.
   9. Verco Manufacturing Co.
   10. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Noncomposite Vented Roof Deck: Fabricate ribbed- and vented-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, and with the following:
   1. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 40, G90 zinc coating.
   2. Profile Depth: As indicated in Structural General Notes.
   3. Design Uncoated-Steel Thickness: As indicated in Structural General Notes.
   4. Span Condition: Triple span or more.
   5. Side Laps: Overlapped or interlocking seam at Contractor's option.
   6. Vent Slot Area: Manufacturer's standard vent slots providing 1-1/2.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth unless otherwise indicated.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

I. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch-wide flanges and sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

K. Galvanizing Repair Paint: ASTM A 780.

L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.
   1. Fasteners shall provide diaphragm shear and uplift resistance equal to or greater than welding indicated herein and on Drawings.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
   1. Weld Diameter: As indicated on Structural Plans.
   2. Weld Spacing: As indicated on Structural Plans.
   3. Weld Washers: Install weld washers at each weld location if deck gauge is lighter than 22 gauge.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals shown on Structural Plans:
   1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
   2. Fasten with a minimum of 1-1/2-inch- long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
   1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.
   1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
   1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: See Section 01 45 23.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
   1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 23

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Requirements including but not limited to:
1. Load bearing wall framing.
2. Exterior nonload bearing wall framing.
3. Floor joist framing.
4. Roof rafter framing.
5. Ceiling joist framing.
6. Soffit framing.
7. Accessories necessary for a complete installation.

1.3 RELATED SECTIONS

A. Section 05 5000 – Metal Fabrications.

B. Section 09 29 00 – Gypsum Board.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, licensed in the State of Texas, to design cold formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads: Indicated on Structural Drawings.
2. Coordinate the requirements on the Structural Drawings with the requirements of this Section. If a conflict exists, notations on the Structural Drawings take precedence.
3. The following document governs the Work, except where more restrictive items are specified:
AISI Design of Cold-Formed Steel Structural Members Wind Load
Minimum Design Loads
    1. As required by code officials having jurisdiction.
    2. Deflection: 1/600 for clear simple spans
    3. Deflection: 1/300 for cantilever conditions and roof parapets
    4. Gauge: 18 gauge minimum, unless noted otherwise.
4. Welding Qualifications: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
5. Studs, tracks, channels, and other light gauge framing members shall conform to requirements of ASTM C955.
6. Fire-Rated Assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating, including those required for compliance with governing regulations, provide units that have been approved by governing authorities that have jurisdiction.
7. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 degrees F (67 degrees C).
8. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure:
    a. Upward and downward movement of 1-1/2 inches (38 mm).
9. Design exterior nonload bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold Formed Steel Framing Design Standards:
1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.

3. Headers: AISI S212.
4. Lateral Design: AISI S213.

1.5 SUBMITTALS

A. Product Data: Technical data for cold formed steel framing product and accessories including factory applied primers.

B. Shop Drawings: Submit layout, spacings, sizes, thickness, and types of cold formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
1. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Supplementary Design Details: The general design is presumed adequate to permit compliance with the specified performance. Provide engineering calculations to supplement the general design. Calculations shall bear the seal of a Registered Professional Engineer, licensed in the State of Texas. Calculations must show design will with stand wind loading commiserate with class and rating of the project.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Welding Qualifications: Qualify procedures and personnel according to the following:
a. AWS D1.1/D1.1M Structural Welding Code - Steel.
b. AWS D1.3/D1.3M Structural Welding Code - Sheet Steel.

2. Comply with AISI North American Specification for the Design of Cold Formed Steel Structural Members and Standard for Cold Formed Steel Framing - General Provisions.
a. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
b. Comply with AISI S230 Standard for Cold Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings.

3. Fire Resistance Ratings: ASTM E 119; testing by a UL. Identify products with appropriate markings of applicable testing agency. Indicate design designations from UL *Fire Resistance Directory*.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Texas and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold formed metal framing that are similar to those indicated in material, design, and extent.
1. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and structural data.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CEMCO; California Expanded Metal Products Co.
2. ClarkDietrich Building Systems.
3. Consolidated Fabricators Corp.; Building Products Division.
4. Marino\WARE.
5. SCAFCO Corporation.
6. The Steel Network.

2.2 LOAD BEARING WALL FRAMING

A. Steel Studs: C shaped steel studs, of web depths indicated, punched, with stiffened flanges:
1. Minimum Base Metal Thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
2. Flange Width: 1-5/8 inches (41 mm).
3. Section Properties: Refer to the Drawings.

B. Steel Track: U shaped steel track, of web depths indicated, unpunched, with straight flanges:
1. Minimum Base Metal Thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
2. Flange Width: 1-1/4 inches (32 mm).

C. Steel Box or Back to Back Headers: C shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges:
1. Minimum Base Metal Thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
2. Flange Width: 1-5/8 inches (41 mm).

D. Steel Single or Double L Headers: L shapes used to form header beams, of web depths indicated:
1. Minimum Base Metal Thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
2. Top Flange Width: 1-5/8 inches (41 mm).
3. Section Properties: Refer to the Drawings.

2.3 EXTERIOR NONLOAD BEARING WALL FRAMING

A. Steel Studs: C shaped steel studs, of web depths indicated, punched, with stiffened flanges:
1. Minimum Base Metal Thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
2. Flange Width: 1-5/8 inches (41 mm).
3. Section Properties: Refer to the Drawings.

B. Steel Track: U shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base Metal Thickness: 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
2. Flange Width: 1-1/4 inches (32 mm).

C. Vertical Deflection Clips: Head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AllSteel & Gypsum Products, Inc.
b. ClarkDietrich Building Systems.
c. Marino\WARE.
d. SCAFCO Corporation.
e. Simpson Strong-Tie Co., Inc.
f. Steel Network, Inc. (The).
g. Steeler, Inc.

D. Single Deflection Track: Single, deep leg, U shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure:
1. Minimum Base Metal Thickness: 0.0428 inch (1.09 mm), 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
2. Flange Width: 1 inch (25 mm) plus the design gap for one story structures and 1 inch (25 mm) plus twice the design gap for other applications.

E. Double Deflection Tracks: Double, deep leg, U shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure:
a. Minimum Base Metal Thickness: 0.0428 inch (1.09 mm), 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
b. Flange Width: 1 inch (25 mm) plus the design gap for one story structures and 1 inch (25 mm) plus twice the design gap for other applications.

2. Inner Track: Of web depth indicated:
a. Minimum Base Metal Thickness: 0.0428 inch (1.09 mm), 0.0538 inch (1.37 mm), 0.0677 inch (1.72 mm), and 0.0966 inch (2.45 mm).
b. Flange Width: 1 inch (25 mm) plus the design gap for one story structures and 1 inch (25 mm) plus twice the design gap for other applications.

F. Drift Clips: Bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.4 SOFFIT FRAMING

A. Exterior Soffit Frame: C shaped steel sections, of web depths indicated, with stiffened flanges:
1. Minimum Base Metal Thickness: 0.0428 inch (1.09 mm)] [0.0538 inch (1.37 mm).
2. Flange Width: 1-5/8 inches (41 mm) minimum.

2.5 FRAMING ACCESSORIES

A. Fabricate steel framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of appropriate thickness and configuration, unless otherwise indicated:
1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

C. Anchors, Clips, and Fasteners:
1. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot dip process according to ASTM A 123/A 123M.
2. Expansion Anchors: Fabricated from corrosion resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
3. Power Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
4. Mechanical Fasteners: ASTM C 1513, corrosion resistant coated, self-drilling, self-tapping, steel drill screws.
   a. Head Type: Low profile head beneath sheathing.
5. Welding Electrodes: Comply with AWS standards.

D. Miscellaneous Materials:
1. Galvanizing Repair Paint: SSPC-Paint 20 or ASTM A 780.
2. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, and plasticizing and water reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30 minute working time.
3. Shims: Load bearing, high density multimonomer plastic, and nonleaching; or of cold formed steel of same grade and coating as framing members supported by shims.
4. Sealer Gaskets: Closed cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from standard widths to match width of bottom track or rim track members.

2.6 FABRICATION

A. Fabricate cold formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI specifications and standards, manufacturer written instructions, and specified requirements.
1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold formed steel framing assembly to a maximum out of square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

3.2 PREPARATION

A. Before sprayed fire resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire resistive materials, remove only as much as necessary to complete installation of cold formed framing without reducing thickness of fire resistive materials below required thickness to obtain fire resistance rating indicated. Protect remaining fire resistive materials from damage.

C. Install load bearing shims or grout between the underside of load bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 ERECTION

A. General:
1. Track Anchors: Install anchors maximum 4 feet - 0 inches on center; design anchors and spacing to carry live, dead and wind loads.
2. Track Splices: Provide channel inserts or weld track splices.
3. Erection: Install members plumb, level, and in a true plane.
4. Fastenings: Make assembly rigid and secure, with welds free of voids and burnouts.

B. Install metal framing systems in accordance with stud manufacturer's printed instructions.

C. Runner Tracks:
1. Install continuous tracks sized to match studs.
2. Align tracks accurately to layout at base and tops of studs.
3. Secure tracks as recommended by stud manufacturer, except do not exceed 24 inches on center for nail or power-driven fasteners, nor 16 inches on center for other types of attachment.
4. Provide fasteners at corners and ends of tracks.
5. Tracks shall be anchored to structural steel prior to installing sprayed on insulation.
6. Provide Deflection Track (DT), at top of stud walls at floor or roof above, typically. Allow for 1/2 inch movement of primary structure. Do not attach studs directly to Deflection Track.
7. Vertical Deflection Clips: Provide manufacturer’s standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure

D. Secure studs to top track and bottom runner track by means of approved self-drilling screws or welding at both inside and outside flanges of 14 gauge or heavier material. Screws and welds shall be of sufficient size to insure strength of connection. All welding shall comply with American Welding Society "Specification for Welding Sheet Steel in Structures."

E. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

F. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure. Use Zee clips as specified above. Weld "Z" shaped clips to structural members as shown on drawings. Maximum 2 feet on center vertical.

G. Install supplementary framing, blocking and bracing in the metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with the stud manufacturer's recommendations and industry standards in each case, considering the weight or loading resulting from the item supported.

H. Frame wall openings with extra studs, equal to the number of studs interrupted by wall openings, placed at each side of wall openings. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with shoes

or by welding, and space jack studs same as full-height studs of the wall. Secure stud system all around to wall opening frame in the manner indicated.

I. Install bracing/bridging in accordance with manufacturer's instructions and design conditions.

J. Touch up field welds and damaged galvanized coating, except touch up of field cut studs is not required.

K. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.

L. Install horizontal stiffeners in stud system, space (vertical distance) at no more than 54 inches on center. Weld at each intersection.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Steel framing and supports for operable partitions.
2. Steel framing and supports for overhead doors.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Elevator machine beams, hoist beams.
6. Steel shapes for supporting elevator door sills.
7. Shelf angles.
8. Metal ships' ladders.
9. Elevator pit sump covers.
10. Miscellaneous steel trim.
11. Loose bearing and leveling plates for applications where they are not specified in other Sections.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.
3. Grout.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy [Group 1] [Group 2] stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat specified in Section 09 91 00 “Painting”

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize and prime shelf angles located in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.1 METAL SHIPS' LADDERS

A. Verify that use of ships' ladders is acceptable to authorities having jurisdiction before retaining this article. ANSI A14.3 and OSHA regulations discourage use of ships' ladders 60 degrees or steeper.

B. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.
1. Treads shall be not less than 5 inches exclusive of nosing or less than 8-1/2 inches including the nosing, and riser height shall be not more than 9-1/2 inches.
2. Fabricate ships' ladders, including railings from steel.
3. Fabricate treads and platforms from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 1/2 inch in least dimension.
4. Fabricate treads and platforms from rolled-steel floor plate.
5. Comply with applicable railing requirements in Section 05 52 13 "Pipe and Tube Railings."

C. Prime steel ships' ladders, including treads, railings, brackets, and fasteners, with requirements of Section 09 91 00 "Painting."

2.2 ELEVATOR PIT SUMP COVERS

A. Fabricate from welded or pressure-locked steel bar grating Limit openings in gratings to no more than 3/4 inch in least dimension.

B. Provide steel angle supports as indicated.

2.3 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

D. Prime in accordance with requirements of Section 09 91 00 "Painting."

2.4 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime plates with requirements of Section 09 91 00 "Painting."

2.5 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.6 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer zinc-rich primer is primer as indicated in Section 09 91 00
2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for ceiling hung toilet partitions overhead doors and overhead grilles securely to, and rigidly brace from, building structure.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 “Painting.”

END OF SECTION 05 50 00

SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Rooftop equipment bases and support curbs.
2. Wood blocking, cants, and nailers.
3. Wood-Preservative-Treated Wood
4. Fire-retardant-Treaded Lumber
5. Plywood backing panels.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NHLA: National Hardwood Lumber Association.
3. NLGA: National Lumber Grades Authority.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:
1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

B. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Do not use material that is warped or that does not comply with requirements for untreated material.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawl spaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Use treatment that does not promote corrosion of metal fasteners.
   2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
   3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
   4. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841]

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

E. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat all miscellaneous carpentry unless otherwise indicated.
   1. Concealed blocking.
   2. Roof framing and blocking.
   3. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
   4. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Rooftop equipment bases and support curbs.
   4. Cants.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.
   1. Mixed southern pine; SPIB.

C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
   1. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC , fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood. Indicate that bolts and nuts are to be recessed flush with surface, unless otherwise indicated.

B. Sheathing boards are to be installed flush and plumb with the joints between the boards not to exceed 1/8-inch. Wherever possible, the finished edge is to face the perimeter of rough openings (exposed gypsum is not a suitable substrate for the air barrier's self-adhered membrane).

C. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

D. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

E. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

F. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.

3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

J. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

L. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

M. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 53

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Wall sheathing.
   2. Parapet sheathing.
   3. Sheathing joint and penetration treatment.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review air-barrier and sheathing requirements and installation, special details, transitions, air-leakage testing, protection, and work scheduling that covers air-barrier and sheathing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
   3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
   4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
1. Products: Subject to compliance with requirements, provide one of the following:
a. CertainTeed Corporation; GlasRoc.
b. G-P Gypsum Corporation; Dens-Glass Sheathing.
c. National Gypsum Company; Gold Bond eXP.
d. United States Gypsum Co.; Securock
2. Type and Thickness: Regular, 1/2 inch thick.
3. Size: 48 by 120 inches for vertical installation.

2.3 PARAPET SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
1. Product: Subject to compliance with requirements, provide one of the following:
a. G-P Gypsum Corporation; Dens-Deck Prime.
b. United States Gypsum Co.; Securock Fiber Roof Board
2. Type and Thickness: Regular, 1/2 inch thick.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacturer.
1. For sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:
1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

D. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Fasten gypsum sheathing to cold-formed metal framing with screws.
   2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
   3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
   1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
   2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Seal sheathing joints according to sheathing manufacturer's written instructions.
   1. Apply sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
   2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 06 16 00

SECTION 06 20 23 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Shelving.

1.3 DEFINITIONS

A. MDF: Medium-density fiberboard.

B. MDO: Plywood with a medium-density overlay on the face.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
3. Include copies of warranties from chemical-treatment manufacturers for each type of treatment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and the following grading rules:
1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."

2. NHLA: National Hardwood Lumber Association, "Rules for the Measurement and Inspection of Hardwood & Cypress."
3. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
4. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
5. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
6. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."

B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
1. For exposed lumber, mark grade stamp on end or back of each piece.

2.2 SHELVING

A. Closet Shelving: Made from the following material, 3/4 inch (19 mm) thick.
1. Particleboard with radiused and filled or solid-wood front edge.
2. MDF with radiused or solid-wood front edge.
3. MDO softwood plywood with solid-wood edge.

B. Shelf Cleats: 3/4-by-5-1/2-inch (19-by-140-mm) boards with hole and notch to receive clothes rods, as specified above for shelving lumber trim for opaque finish.

2.3 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

B. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

2.4 FABRICATION

A. Back out or kerf backs of the following members except those with ends exposed in finished work:
1. Interior standing and running trim except shoe and crown molds.

B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, too small to fabricate with proper jointing arrangements, or with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.

2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 INSTALLATION OF SHELVING

A. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

B. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches o.c.

C. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled.
1. Install shelves, fully seated on cleats, brackets, and supports.
2. Fasten shelves to cleats with finish nails or trim screws, set flush.

3.5 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes, if any.

3.7 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 23

SECTION 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Plastic-laminate-faced architectural cabinets.
   2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   2. Show locations and sizes of cutouts and holes for electrical switches and outletsand other items installed in architectural plastic-laminate cabinets.

C. Samples for Verification:
   1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finishand specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of product.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups of typical plastic-laminate cabinets as shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET FABRICATORS

A. Fabricators: Must meet the requirements in the Qualification Assurance section of the specifications.

2.2 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
   1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom

C. Type of Construction: Frameless.

D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

E. Core Material:
   1. Exposed casework in non-wet areas: Medium-density fiberboard, MDF, MR10 – ANSI A208.2, Grade 130
   2. All casework in semi-wet areas (restroom and breakrooms with sinks): Medium-density fiberboard, MR30 – ANSI A208.2, Grade 155
   3. All casework in wet areas (laboratories, locker rooms, laundry area and cafeteria): Medium-density fiberboard, MR50 - ANSI A208.2, Grade 150

F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Abet Laminati, Inc.
      b. Formica Corporation.
      c. Lamin-Art, Inc.
      d. Panolam Industries International, Inc.
      e. Wilsonart International; Div. of Premark International, Inc.

G. Laminate Cladding for Exposed Surfaces: Refer to Drawings.

H. Edgebanding: Refer to Drawings.

2.3 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Medium-Density Fiberboard: ANSI A208.2, made with binder containing no urea formaldehyde.
   2. Softwood Plywood: DOC PS 1.

2.4 CABINET HARDWARE AND ACCESSORIES

A. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch- thick metal, and as follows:
   1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
   2. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.

B. Cabinet Hardware Schedule: As indicated on Drawings.

C. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

D. Shelf Rests: BHMA A156.9, B04013; metal.

E. Drawer Slides: BHMA A156.9.
   1. Grade 1HD-100 : Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
   2. File Drawer Slides:
      a. Integrated drawer slide and side panel, full extension, self-closing feature with 2-5/8 inches (60 mm) self-closing range, built-in drawer front adjustment and bumpers, smooth, quiet travel, white baked-on epoxy finish.
   3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 2.
      a. Pencil Drawer Slides:
   4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1.
   5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100.
   6. File Drawer Slides: Full extension member and file railing system.
   7. For computer keyboard shelves, provide Grade 1
   8. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-100].

F. Door Locks: BHMA A156.11, E07121.

G. Drawer Locks: BHMA A156.11, E07041.

H. Door and Drawer Silencers: BHMA A156.16, L03011.

I. Hanging Rail System for Wall Cabinets:
   1. Hafele; Wall and Rail and Suspension Fitting, Item No. 290.00.700 and 701.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Finish Type: As indicated on Drawings.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement].
   1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.6 FABRICATION

A. Fabricate cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
1. Use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

SECTION 07 01 53 - ROOF MODIFICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes the following:
   1. Modifications to existing roofing system in preparation for tie-in with new adjacent compatible roofing system.
   2. Protection of existing roofing system that is not to be modified or disturbed.

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. Existing Membrane Roofing System: Roofing membrane, surfacing, and components and accessories between deck and roofing membrane.

C. Existing to Remain: Existing items of construction that are not indicated to be removed.

1.5 SYSTEM DESCRIPTION

A. Designated Roof Areas: Remove existing perimeter flashings, base flashings, counter flashings, vent stack flashings, roofing membrane, insulation, and other system components as required for roofing work.

B. Provide products required by manufacturers to be fully compatible with each other and with indicated substrates, or provide separation materials as required to eliminate contact between incompatible materials.

C. Provide new roof membrane, insulation, and flashing to accommodate roof mounted equipment removal or relocation, penetrations, and new building addition.

D. Performance Requirements: Prevent water infiltration through roof membrane penetrations or modifications resulting from work described in Contract Documents.

E. Industry Standards: Conform to NRCA - Roofing and Waterproofing Manual, except where more stringent requirements are indicated.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product specified.
   1. Include list of materials and data sheets describing physical characteristics and performance criteria for materials proposed for use as well as applicable standards met by each product.
   2. Temporary Roofing: Include Product Data and description of temporary roofing system. If temporary roof will remain in place, submit surface preparation requirements needed to receive permanent roof, and submit a letter from roofing membrane manufacturer stating acceptance of the temporary membrane, and that its inclusion will not adversely affect the roofing system's resistance to fire and wind.

B. Shop Drawings: Submit details for this specific project indicating construction at penetrations, terminations, flashings, drains, and tie-in to existing roof.

1.7 INFORMATIONAL SUBMITTALS

A. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by roofing modification operations. Submit before Work begins.

B. Certifications specified in Quality Assurance article.

C. Qualification Data: For Installer, including certificate that Installer is approved by warrantor of existing roofing system.

D. Manufacturer's Installation Instructions: Submit manufacturer’s printed installation instructions for each product.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 01.

B. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roof installation.

C. Warranty: Submit specified warranty in accordance with Division 1.

1.9 QUALITY ASSURANCE

A. Applicator Qualifications: Approved by manufacturer for making modifications and repairs to existing warranted roofing prior to execution of this Contract.
   1. Minimum of 5 years documented experience in roofing repairs of this type of roof.
   2. Include list of completed projects having similar scope of work identified by name, location, date, reference name, and phone number.

B. Materials Removal Firm: Company specializing in performing the work of this Section with minimum 5 years documented experience.

C. Certifications:
   1. Submit manufacturer’s certification stating materials ordered and supplied are compatible with existing roofing system and will not void existing warranty.
   2. Submit manufacturer’s project registration form indicating that manufacturer has reviewed Project and will issue or extend existing warranty to cover repairs warranty upon successful completion of installation.
   3. Submit manufacturer’s approval of applicator.
   4. Certify materials shipped to Project site meet roof manufacturer’s published performance standards and requirements of this Specification.
   5. State that membrane manufacturer approves of insulation type and method of installation.

D. Regulatory Requirements: Comply with governing EPA notification regulations before beginning membrane roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.10 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately below roofing modification area. Conduct roof modifications so Owner's operations will not be disrupted. Provide Owner with not less than 2 weeks notice of activities that may affect Owner's operations.
   1. Coordinate work activities daily with Owner so Owner can place protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below the work area if desired.
   2. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below the affected area. Verify that occupants below the work area have been evacuated prior to proceeding with work over the impaired deck area.

B. Protect building where roofing is scheduled to be modified, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from modification operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

D. Owner assumes no responsibility for condition of areas to be modified.
   1. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.

E. Handle and store roofing materials and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.

F. Weather Limitations: Proceed with roofing modification work only when existing and forecasted weather conditions permit Work to proceed without water entering into existing roofing system or building.
1. Emergency Equipment: Maintain on-site equipment necessary to apply emergency temporary edge seal in the event of sudden storms or inclement weather.
2. Maintain continuous temporary protection prior to and during installation of new roofing system.

G. Hazardous Materials: It is not expected that hazardous materials such as asbestos-containing materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

1.11 SEQUENCING AND SCHEDULING

A. Schedule work to coincide with commencement of installation of new roofing system.

B. Remove only existing roofing materials that can be replaced with new materials the same day.

C. Coordinate the work with other affected mechanical and electrical work associated with roof penetrations.

1.12 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during roof modification work, by methods and with materials so as not to void existing roofing system warranty. Notify warrantor before proceeding.
1. Notify warrantor of existing roofing system on completion of roofing modifications, and obtain documentation verifying that existing roofing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

B. If roofing system manufacturer’s warranty is no longer in effect on the existing roof system, upon completion of Work and prior to final payment, furnish written warranty signed by installer and Contractor stating that for 2 year period from date of Substantial Completion of Building repairs and maintenance will be made to maintain roofing and flashings in watertight condition.

PART 2 - PRODUCTS

2.1 INFILL AND PATCHING MATERIALS

A. Use infill and patching materials, including sheet and adhesive materials, flashings, roof surfacing, fasteners, adhesives, and accessories, matching existing membrane roofing system materials, unless otherwise indicated.

2.2 AUXILIARY MATERIALS

A. General: Auxiliary preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing membrane roofing system

B. Insulation: Type used in original roof construction in thickness necessary to achieve satisfactory repair of membrane with no ponded water.

C. Wood Blocking and Nailers: As specified in Division 06.

D. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."

E. Mechanical Fasteners and Disks: Appropriate for purpose intended and approved by UL or FM; length required for thickness of materials, fluoropolymer finish complete with disks; manufacturer as required by membrane manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing modifications will be performed with Installer present for compliance with requirements.

B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.

C. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at roof penetrations and terminations and match the thicknesses of insulation required.

D. Do not proceed with installation until unsatisfactory conditions have been corrected.

E. Do not apply roofing materials to damp, frozen, dirty, dusty or other surface conditions which are unacceptable to manufacturer or applicator.

3.2 PREPARATION

A. Protect existing membrane roofing system that is indicated not to be modified.

B. Coordinate with Owner to shut down air intake equipment in the vicinity of the Work. Cover air intake louvers before proceeding with roof modification work that could affect indoor air quality or activate smoke detectors in the ductwork.

C. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
   1. If roof drains will be temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

E. Verify that rooftop utilities and service piping have been shut off before commencing Work.

3.3 PROTECTION

A. Protect existing building surfaces against damage from roofing installation.

B. Provide temporary seals to prevent water from entering completed sections of the roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 FLASHING AND REPAIR WORK

A. General: Perform work in accordance with instructions and recommendations of manufacturer of original installation materials.

B. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing with a power broom.

C. Clean substrate of contaminants such as dirt, debris, oil, and grease that can affect adhesion of roof patching materials.

D. Cut holes for penetrations neatly and in accordance with Division 01 Section “Cutting and Patching.”

E. Where continuity of existing fastener pattern has been interrupted by cutting and patching work, provide additional uplift securement for existing roofing system with new screws and plates applied to each roof zone to comply with same wind uplift requirements as specified for new roofing work.

F. Lay base flashing and seal down to membrane and penetration.

G. Strip in flashing with multiple layers of felt and bitumen on built-up systems and with one layer of sheet material on single-ply systems.

H. Counterflash as required.

I. Make watertight.

J. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish.

3.5 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
   1. Notify Architect and Owner 48 hours in advance of the date and time of inspection.

B. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.

3.6 DISPOSAL

A. Collect and place demolished materials in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
   1. Storage or sale of demolished items or materials on-site will not be permitted.

B. Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 07 14 00 - ELEVATOR PIT WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following applications for use at elevator pits:
   1. Positive side, horizontal slab application.
   2. Positive side, vertical wall application.
   3. Molded-sheet drainage panels.

1.1 PREINSTALLATION MEETINGS

A. Preinstallation Conference:
   1. Conduct meeting at Site.
   2. Review requirements for waterproofing Work, including:
      a. Construction schedule
      b. Availability of materials, Waterproofing Installer’s personnel, equipment, and facilities needed to make progress and avoid delays.
      c. Site use, access, staging, and set-up location limitations.
      d. Forecast weather conditions.
      e. Approved mockup procedures.
      f. Surface preparation and substrate condition and pretreatment.
      g. Installation procedures.
      h. Special details and flashings.
      i. Minimum cure period.
      j. Testing and inspection requirements.
      k. Temporary protection and repair of waterproofing.
      l. Structural loading limitations of deck.
      m. Government regulations.

B. Contractor’s Site superintendent, waterproofing manufacturer’s technical representative, Waterproofing Installer’s representative, Owner’s Representative, and Architect shall attend.

1.2 SUBMITTALS

A. Product Data: For each type of product.
   1. Include typical construction details, material descriptions, and tested physical and performance properties of waterproofing.
   2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.
   3. Include installation instructions
   4. Include manufacturer’s typical recommended procedures for repair of contaminated or damaged membrane.

B. Shop Drawings: Show project specific details, locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, expansion joints, and other termination conditions.
   1. Include manufacturer’s written approval of shop drawings prior to submission.

C. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

D. Submit evidence that Installer’s existing company has minimum of 5 years continuous experience in application of specified materials. Submit list of at least five completed projects of similar scope and size, including:
   1. Project name.
   2. Owner’s name.
   3. Owner’s Representative name, address, and telephone number.
   4. Description of work.

5. Self-adhering sheet materials used.
6. Project supervisor.
7. Total cost of waterproofing work and total cost of project.
8. Completion date

E. Sample Warranties: Copies of waterproofing manufacturer's warranty, Installer's warranty, and General Contractor's warranty, all stating obligations, remedies, limitations, and exclusions. Submitted with Bid.

F. Coordination: Submit waterproofing installation sequencing plan, coordinated with concrete placement schedule. Include plans for protection of waterproofing membrane at construction joints and interfaces with the work of adjacent Packages.

G. Field Quality Control: Reports for site visits of waterproofing manufacturer's representative.

H. Prior to installation of waterproofing system, letter from waterproofing manufacturer stating approval of use of waterproofing system on Project and eligibility for manufacturer's warranty, based on review of:
1. Manufacturer's Project Registration Form, with information filled out completely and accurately, including any deviations from Specification.
2. Complete set of shop drawings of waterproofing system installation showing substrate limits, outline, dimensions, transitions, and types and locations of penetrations.
3. Atypical or special condition details which are to be used.

I. Following completion of the Work:
1. Waterproofing manufacturer's warranty inspection reports.
2. Completed joint and several warranty from waterproofing manufacturer and Waterproofing Installer.
3. Completed joint and several warranty from Contractor and Waterproofing Installer.

1.3 QUALITY ASSURANCE

A. Waterproofing Installer Qualifications: Experienced firm that has successfully completed waterproofing work similar in material, design, and extent to that indicated for the Project; that is approved, authorized, or licensed by waterproofing manufacturer to install waterproofing; and that is eligible to receive waterproofing manufacturer's warranty. Must have successful installations of specified materials in local area in use for minimum of five years.

B. Employ foreman trained by waterproofing manufacturer and with minimum five years of experience as foreman on similar projects to be at Site at all times during the Work. Source Limitations: Obtain waterproofing materials molded-sheet drainage panels through one source from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

B. Do not apply waterproofing in snow, rain, fog, or mist.

C. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.6 WARRANTY

A. Manufacturer's Warranty: Furnish manufacturer's written material and labor warranty signed by an authorized representative using manufacturer's standard form agreeing to furnish materials and labor required to repair or replace work which exhibits material defects caused by manufacture or design and installation of product. "Defects" is defined to include but not limited to deterioration or failure to perform as required.

1. Warranty Period: Manufacturer shall warrant the products to be free from material and labor Defects for a period of 10 years from date of Substantial Completion.
    a. Warranty includes below grade expansion joints and/or other accessory materials necessary to provide a complete installation.

B. Installer's Warranty: Furnish installer's written workmanship warranty signed by an authorized representative using installer's standard form agreeing to provide labor required to repair or replace work which exhibits workmanship defects. "Defects" is defined to include but not limited to deterioration or failure to perform as required.
    1. Warranty Period: Installer shall warrant the installation to be free from workmanship Defects for a period of 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ELEVATOR PIT WATERPROOFING; POSITIVE SIDE, HORIZONTAL SLAB APPLICATION

A. Products: Subject to compliance with requirements, provide the following:
    1. GCP Applied Technologies; Preprufe 275.

B. HDPE Sheet Waterproofing:
    1. Physical Properties: As follows, measured per standard test methods referenced:
        a. Tensile Strength, Film: 4000 psi minimum; ASTM D 412.
        b. Low-Temperature Flexibility: Pass at minus -20 deg F; ASTM D 1970.
        c. Peel Adhesion to Concrete: 10 lbf/in.; ASTM D 903, modified.
        d. Lap Adhesion: 10 lbf/in.; ASTM D 1876, modified.
        e. Hydrostatic-Head Resistance: 231 ft.; ASTM D 5385, modified.
        f. Vapor Permeance: 0.01 perms; ASTM E 96, Water Method.
        g. Water Absorption: 0.5 percent; ASTM D 570.

2.2 ELEVATOR PIT WATERPROOFING; POSITIVE SIDE, VERTICAL WALL APPLICATION

A. Cold applied, flexible, preformed waterproof membrane with cross-laminated, HDPE carrier film with a self-adhesive rubber bitumen compound.
    1. Basis of Design: GCP Applied Technologies; Bituthene 3000 with B2 LVC primer

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by waterproofing material manufacturer.

D. Penetration and Terminations: Preprufe Tape

E. Waterstop: Hydrophilic, non-bentonite waterstop for non-moving construction joints or approved equal.
    1. Basis-of-design product is Adcor ES manufactured by GCP Applied Technologies

F. Termination Bars: ASTM A666, Type 304 stainless steel or aluminum; approximately 1-inch wide by 1/8-inch thick; with predrilled holes at 8 inches on center.

G. Fasteners:
    1. For concrete and masonry substrates:
        a. Made of corrosion-resistant materials.
        b. Mushroom-head anchors: 1/4-inch diameter, 1-1/4-inch embedment minimum.
        c. Use Zamac Nailin manufactured by Power Fastening, Inc., or equal.

2.4 MOLDED-SHEET DRAINAGE PANELS

A. Non-woven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 100 sieve laminated to 1 side with a polymeric film bonded to the other side of a 3-dimensional, non-biodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of at least 15 gpm per ft.
   1. Basis of Design: GCP Applied Technologies; Hydroduct 220 Drainage Composite

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting installation or performance of the waterproofing.
   1. Ensure that work done by other trades is complete and ready for waterproofing Work.
   2. Verify that areas and conditions under which waterproofing Work is to be performed permit proper and timely completion of Work.
   3. Notify Architect in writing of conditions which may adversely affect installation or performance of waterproofing system and recommend corrections.
   4. Do not proceed with waterproofing until adverse conditions have been corrected and reviewed by Architect.
   5. Commencing waterproofing Work constitutes acceptance of Work surfaces and conditions.

3.2 PREPARATION AT TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, and sleeves according to ASTM C 898 and ASTM C 1471 and manufacturer's written instructions.

B. Prime substrate unless otherwise instructed by waterproofing manufacturer.

C. On vertical surfaces, apply waterproofing in two separate applications, and embed a joint reinforcing strip in the first preparation coat when recommended by waterproofing manufacturer.
   1. Provide sealant cants around penetrations and at inside corners of deck-to-wall butt joints when recommended by waterproofing manufacturer.

3.3 JOINT AND CRACK TREATMENT AT FLUID APPLIED SYSTEMS

A. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898 and ASTM C 1471 and waterproofing manufacturer's written instructions. Remove dust and dirt from joints and cracks, complying with ASTM D 4258, before coating surfaces.
   1. Comply with ASTM C 1193 for joint-sealant installation.
   2. Apply bond breaker between sealant and preparation strip.
   3. Prime substrate and apply a single thickness of preparation strip extending a minimum of 3 inches (75 mm) along each side of joint. Apply waterproofing in two separate applications and embed a joint reinforcing strip in the first preparation coat.
   4. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D 4258.

B. Install sheet flashing and bond to deck and wall substrates where indicated or required according to waterproofing manufacturer's written instructions. Extend sheet flashings onto perpendicular surfaces and other work penetrating substrate according to ASTM C 898.

3.4 HORIZONTAL SHEET MEMBRANE APPLICATION

A. Horizontal Applications: Install in accordance with instructions in manufacturer’s published literature including, but not limited to, the following:
   1. Verify correct orientation of the membrane with respect to the inner and outer face of the placement. End laps should be staggered to avoid a build-up of layers.
   2. Leave the plastic release liner in position until overlap procedure is completed.
   3. Accurately position succeeding sheets to overlap the previous sheet 3 in. along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap.

3.5 VERTICAL SHEET-WATERPROOFING APPLICATION

A. Install sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.
   1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

F. Seal cut edges and end laps of sheet-waterproofing terminations with liquid membrane.

G. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

H. Correct deficiencies in or remove and replace sheet waterproofing that does not comply with requirements.
   1. Repair tears, voids, and lapped seams in waterproofing not complying with requirements.
   2. Slit and flatten fishmouths and blisters.
   3. Patch defects with sheets extending 6 inches beyond repaired areas in all directions

I. Immediately install protection course with butted joints over waterproofing membrane.
   1. Molded drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.
   2. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller.
   3. Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.

3.6 WATERSTOP INSTALLATION

A. Install waterstops in accordance with instructions in manufacturer’s published literature including, but not limited to, the following:
   1. Secure waterstops using masonry nails 1½ in. - 2 in. long with a washer ¾ in. in diameter. Hilti EM6-20-12 FP8 shot fired fixings with ¼ in. nuts and ¾ in. diameter washers may also be used. Fixings should be spaced at a maximum of 12 in. centers with a minimum spacing that ensures proper contact to substrate.
   2. On irregular concrete faces, or on vertical surfaces, apply a ½ in. bead of manufacturer’s recommended adhesive as bedding for waterstop.
   3. Waterstop joints should overlap a minimum of 4 in., ensuring full contact between jointed pieces.

3.7 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Lap edges and ends of geotextile to maintain continuity. Protect installed panels during subsequent construction.

3.8 FIELD QUALITY CONTROL

A. Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish daily reports to Architect.

3.9 PROTECTION AND CLEANING

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Protect installed from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Mineral-wool board insulation.
2. Glass-fiber blanket insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Install cavity wall insulation and interior gypsum board only after building is enclosed with exterior wall assembly as detailed in the drawings.

PART 2 - PRODUCTS

2.1 MINERAL-WOOL BOARD INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Owens Corning.
2. Rockwool International.

B. Unfaced, Mineral-Wool Board Insulation: ASTM C 612; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Schedule:
1. Type A: Basis of Design, Rockwool Cavityrock, 4.4 lbs/ft3 minimum
   a. R-Value/Thickness: As indicated on drawings.
2. Type B: Basis of Design, Rockwool Comfortboard 110, 11.0 lbs/ft^3
   a. R-Value/Thickness: As indicated on drawings.

2.2 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CertainTeed Corporation.
2. Knauf Insulation.
3. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
   1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
   2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

D. Schedule:
   1. Framed Walls: For use inside framed exterior walls
      a. R value: As indicated on Drawings.

2.3 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
   1. Subject to compliance with requirements, provide one of the following:
      a. Series T TACTOO Insul-Hangers.
      b. Spindle Type.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 07 21 29 - SPRAY-APPLIED INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Spayed-on Cellulose Fiber Insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 Samples for Verification: Furnish materials to be used with labels indicating colors, finish characteristics, and locations of the Work. Samples will be reviewed for color and appearance only. INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by SFRM manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its SFRM to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Regulatory Requirements: Comply with all applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

C. Single Source Responsibility: Obtain materials from a single manufacturer for the complete system.

1.5 DELIVER, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.

B. Store materials inside, under cover, and aboveground; keep dry until ready for use. Remove from Project site and discard wet or deteriorated materials. Do not open packaging nor remove labels until time of installation.

C. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

1.6 PROJECT CONDITIONS

A. Ventilation: Ventilate building spaces during and after application of spray-applied insulation material. Use natural means or, where this is inadequate, forced-air circulation until insulation dries thoroughly.

1.7 COORDINATION

A. Sequence and coordinate application of spray-applied insulation with other related work specified in other Sections to comply with the following requirements:
1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
2. Provide temporary enclosures for applications to prevent deterioration of insulation due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
3. Avoid unnecessary exposure of insulation to abrasion and other damage likely to occur during construction operations subsequent to its application.

B. Do not apply insulation to metal roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply insulation to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of insulation.

C. Do not apply insulation to metal floor deck substrates until concrete topping has been completed.

D. Do not begin applying insulation until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.

E. Defer installing ducts, piping, and other items that would interfere with applying insulation until application of insulation is completed.

F. Do not install enclosing or concealing construction until after insulation has been applied, inspected, and corrections have been made to defective applications.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Spayed-Applied Cellulose Fiber Insulation: ASTM E 1042, Type II, chemically treated recycled natural fibers bound together with special adhesives.
   1. Thickness: As indicated on Architect's Master Schedule.
   2. Color: As indicated on Architect's Master Schedule.
   3. Bond Strength: ASTM E 736, 400 lbs / sq. ft.
   4. Surface Burning Characteristics: ASTM E 84.
      a. Flame Spread: 5
      b. Smoke Developed: 5
   5. Bond Deflection: ASTM E 759
   6. Basis of Design Product: International Cellulose Corporation "K-13 Spray-On System"

2.2 ACCESSORY MATERIALS

A. Primer: Type as recommended by spray-applied insulation manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

B. A substrate is in satisfactory condition if it complies with the following:
   1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
   2. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, incompatible paints, or other foreign substances capable of impairing bond of insulation with substrates under conditions of normal use or exposure.
   3. Objects penetrating insulation, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
   4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying material.

C. Verify that concrete work on steel deck has been completed, if applicable.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate installation of work to be installed under and penetrating insulation prior to application of insulation.

B. Protection: Cover other work subject to damage from fallout or overspray of fire-resistive materials during application. Provide masking, drop cloths or other covering for materials and surfaces which are not to receive insulation.

C. Clean substrates of substances that could impair bond of insulation, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, and paints.

D. Prime substrates where recommended in writing by SFRM manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive SFRM.

3.3 INSTALLATION

A. General: Install system in accordance with manufacturer's printed installation instructions, submittals, applicable industry standards, and governing regulatory requirements for the Work.

B. Coat substrates with bonding adhesive before applying insulation materials to achieve proper adhesion or as may be otherwise recommended by insulation manufacturer for material and application indicated.

C. Extend insulation in full thickness over entire area of each substrate to be insulated.

D. Install with insulation manufacturer-recommended equipment.

E. Install in thickness indicated as measured by ASTM E 605.

F. Apply protective coating to all exposed surfaces. Protective coating need not be applied to insulation surfaces concealed behind gypsum board.

3.4 CLEANING AND PROTECTION

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Coordinate application of insulation with other construction to minimize need to cut or remove completed applications. As installation of other construction proceeds, inspect insulation and patch any damaged or removed areas.

C. Protect the Work so it will not deteriorate or be damaged.

END OF SECTION

SECTION 07 26 35 - MOISTURE VAPOR EMISSION CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Provide concrete moisture vapor emission control system in accordance with requirements of the Contract Documents.

B. Section includes the following:
   1. Two-component, one-coat application process incorporating a water based moisture vapor emission control system to be applied on a Unit Price basis.
      a. System described in this Section is not included in the Contract, but is only to be used in the event that results of pre-construction testing performed on floor slabs scheduled to receive adhered finish flooring systems determine that moisture content, vapor emission levels, or pH of concrete floor slabs exceeds adhesive and finish flooring system manufacturer's recommended maximum levels.
   2. Prescribed system treatment including:
      a. Shot-blasting surface preparation.
      b. Control System, 2 coats.
      c. Non-Porous Primer as required by manufacturer.
      d. Portand-based cementitious underlayment topcoat, gypsum products are unacceptable.
   3. Work of this Section applies to new concrete sub-floors, and existing concrete subfloors, scheduled to receive adhesively and directly-attached finish flooring.

1.2 DEFINITIONS

A. MVETR: Moisture Vapor Emission Transmission Rate, measured in pounds of moisture transmitted per 1,000 square feet of floor area per 24 hours.

1.3 SYSTEM DESCRIPTION

A. Concrete Moisture Vapor Emission Control System: Combination of a two-component epoxy liquid penetrant coating and an additional non-porus primer and a 1/8-inch cementitious underlayment topcoat to mechanically and chemically restrict excessive relative humidity levels, moisture vapor emission rates and alkalinity-pH in concrete substrates for compliance with subsequent floor covering or coating materials.

B. Material Compatibility: Provide materials that are compatible with one another under conditions of service and application required, as demonstrated by system manufacturer based on testing and long-term field experience.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product specified.
   1. Technical data sheet demonstrating compliance with specified requirements.
      a. Concrete Moisture Vapor Emission Control System components
      b. Non-porous primer product
      c. Cementitious underlayment topcoat product

1.5 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install vapor emission control system.

B. Qualification Data: For Installer and manufacturer.

C. Manufacturer's Field Inspection Reports and /or pre-installation checklist.

D. Test Reports: Meeting compliance with product attributes requirements and ASTM Laboratory testing.

1.6 CLOSEOUT SUBMITTALS

A. Warranties: Special warranties specified in this Section.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced firm that is approved, authorized, or licensed by control system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
   1. Minimum 5 years verifiable contracting experience in the installation of floor coatings and concrete preparation
   2. Minimum of 5 years verifiable experience in the installation of concrete moisture vapor emission control similar to that specified for this Project.

B. Manufacturer Qualifications:
   1. Minimum 5 years of producing moisture vapor emission control system products.
   2. Technical personnel with a minimum 5 years of experience with moisture vapor emission control emission products.
   3. Maintain product liability insurance in the amount of 5 million per occurrence.
   4. Warranty program covering:
      a. Costs associated with repair or replacement of concrete vapor emission control system and finish floor covering or coating, including repair or replacement labor.
      b. Costs for both control system materials and installed accessories.

C. Source Limitations: Obtain specified products from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work and will warrant entire system performance.

D. Preinstallation Testing:
   1. Moisture Vapor Emission Rate: Maximum 3.0 lbs per ASTM F 1869.
   2. Alkalinity-pH Level: Maximum 9.0pH per ASTM F 710.
   3. Relative Humidity: Maximum 75 percent per ASTM F 2170.
   4. Perform testing in an acclimated-HVAC controlled environment.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting vapor emission control system application.

B. Maintain a temperature of not less than 60 deg F or more than 95 deg F and humidity levels of less than 40 percent prior to, during and 72 hours after application process unless manufacturer's written recommendations specify tighter temperature range or longer time periods.

C. Close spaces to traffic during application process and 24 hours after installation process or as accepted in writing by manufacturer and installer.

1.10 WARRANTY

A. Warranty: Manufacturer to warrant control system products and components to maintain adhesion to all types of concrete substrates, concrete silicates and treatments, tolerant to moisture, alkalinity-pH and relative humidity during a 15 year period. Warranty includes repair and replacement of flooring products, coatings, primers and finishes applied over the control system surface and labor costs in the event of system failure during warranty period.

B. Workmanship and Materials Warranty:
   1. Manufacturing Defects Warranty Period: 15 years.
   2. Installation Defects Warranty: 15 years.
   3. Warranty Covering Improper Installations: 15 years.
   4. Moisture and Alkalinity Damage to Flooring: 15 years.
   5. Manufacturer’s warranty shall cover the following:

a. 98% Relative humidity level per ASTM F2170
b. Alkalinity-pH level of 14pH per ASTM F710
c. Control system components.
d. Floor covering systems including resinous systems.
e. Adhesives, patching materials and installation accessories.
f. Labor charges involved.
g. Improper installation of control system.

6. Warranty shall commence from Date of Substantial Completion.

C. Warranty shall not exclude foreign salts, admixtures, resin and silicate surface treatments or cohesive substrate failure in the concrete surface due to normal concrete movement. Installation deems acceptance of on-site conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide moisture vapor emission control system by one of the following:
1. Ardex Engineered Cements.
a. Product: Ardex MC Rapid.
2. Synthetics International.
a. Product: Synthetic30.
3. Koster American Corp.
a. Product: VAP I 2000.
1. MAPEI Corporation
a. Product: Planiseal VS.

2.2 MATERIALS

A. Acceptable Product: Two-component, water-based or 100% epoxy type product containing no latex, acrylic, organic additives or chemistries that may re-emulsify or support micro-organism growth.

B. Product Attributes:
1. Performance: Confirmed by independent third party laboratory testing.
a. Water Vapor Transmission Rate per ASTM E 96: Maximum 0.40 grams/h-m(2)
b. Alkali Resistance per ASTM D 1308: Resistance to 14 pH, and resistance to 10 percent sodium hydroxide for 16 hours.
c. Adhesion Strength per ASTM D 4541/D7234: 500 psi or 100 percent concrete failure.
d. Relative Humidity per ASTM F 2170: Restrict 98 percent humidity.
2. Environmental:
a. Growth Resistance: Product shall not support the growth of mold, mildew or biological growth.
b. Safety: Non-corrosive, non-toxic, and non-hazardous to installers.
c. Water Pollution: Non-marine pollutant, safe for natural water sources.

C. Primers and Cementitious Underlayment Topcoat: Moisture tolerant non-porous primer and covered by a self-leveling cement or calcium aluminate based product with a compressive strength of 4,000 psi per ASTM C 109, as approved in writing by control system manufacturer.
1. Nominal thickness of 1/4 inch.

D. Water: Potable and at a temperature of not more than 70 deg F .

PART 3 - EXECUTION

3.1 EXAMINATION

A. Preinstallation Testing: Refer to Division 09 Section “Preinstallation Testing for Floor Coverings.”

B. Verify building is enclosed with windows, doors and other building components installed to prevent rain, wind and contamination during applications. Ideal conditions are under balanced HVAC operation before, during and after installation process.

3.2 PREPARATION

A. Surface Preparation: Shot-blast surfaces using a #420 shot to expose absorbent concrete layer (ICRI Concrete Surface Profile 3 to 4).
   1. Employ mechanical grinder near wall base, edges, columns and other areas not accessible by shot-blasting equipment.
   2. Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair bond.

B. Prepare control joints and cold joints with manufacturer's recommended joint-membrane dispersion system.
   1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through cementitious topcoat.
   2. Properly treat slab on deck voids during applications to prevent migration to lower grade levels during application.

C. Vacuum entire prepared surfaces clean of debris and preparation methods. Do not use sweeping compounds, wet mops or acid etching products.

3.3 APPLICATION

A. Apply control system in accordance with manufacturer's instructions for a warranted system.

B. Application Temperature Limits: Install control system treatments within the following temperature limitations:
   1. Minimum 65 deg F, maximum 85 deg F. Contact manufacturer for specific hot weather conditions.

C. Application Method:
   1. Follow manufacturer recommendations for application.
   2. Process shall produce the following performance:
      a. Moisture Vapor Emission, ASTM F 1869: Control up to 20 lbs.
      b. Concrete Alkalinity, ASTM F 710: Control up to 14pH.
      c. Relative Humidity, ASTM F 2170: Control up to 98 percent relative humidity.

3.4 CEMENTITIOUS UNDERLAYMENT TOPCOAT

A. General: Mix and apply underlayment components according to manufacturer's written instructions in areas scheduled to receive adhesive-applied floor coverings.
   1. Close spaces to traffic during application process and 24 hours after installation process or as accepted in writing by manufacturer and installer.
   2. Coordinate application of components to provide optimum underlayment adhesion.

B. Apply non-porous primer or manufactures recommended fine sand over control system surface to promote optimum cementitious underlayment topcoat adhesion.

C. Apply underlayment to produce uniform, level surface, minimum 1/8 inch thick.
   1. Cover preparation methods, holes, cracks and joints.
   2. Apply in accordance with manufacturer's recommendations to maintain proper thickness of product.
   3. Feather edges to match adjacent floor elevations.
   4. Final Surface: Smooth and compatible with specified floorings and flooring adhesives.

D. Allow underlayment to dry for a minimum of 24 hours at temperatures above 75 degrees F and 48 hours for temperatures of less than 75 degrees. Prevent contamination during application and use fans to promote the curing process in accordance with manufactures recommendations.

E. Underlayment installation shall be smooth, no ridges and ready for flooring applications.

F. Verify underlayment application has acceptable adhesion, proper bonding properties, shows no signs of defects or hollow spots prior to flooring installation.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Services:
   1. Conduct on site inspections before and after control system process.
   2. Notify Architect in writing of non-warranted conditions.
   3. Submit results to Owner and Architect for review prior to flooring applications.

4. Repair/ Replacement control system at no cost to Owner in the following areas not meeting parameters:
   a. Manufacturer thickness requirements
   b. Underlayment applications not meeting requirements
   c. Defective components of installation.

3.6 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION

SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes fluid-applied, vapor-permeable membrane air barriers.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.
   2. Attendees to include Architect, Sub-contractor, General Contractor, Manufacturer Rep and Envelope Consultant.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: Show project specific details, locations and extent of air barrier and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining construction.
   1. Include manufacturer’s written approval of shop drawings prior to submission.
   2. Include details of interfaces with other materials that form part of air barrier.
   3. Include layouts and full-size details for all work covered under this section.

C. Manufacturer Inspection Report

D. Applicator Approval: Submit letter from manufacturer stating applicator is approved to install the specified air barrier system.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Installation Instructions: Submit manufacturer’s installations instruction for the air barrier system.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
   1. Installer shall be licensed by ABAA and shall employ ABAA-certified installers and supervisors on Project.

2. Source Limitations: Provide air barrier membrane and accessory materials produced by single manufacturer.

B. Mockups: Build mockups to set quality standards for materials and execution.
1. Build integrated mockups of exterior wall assembly**,** 150 sq. ft. incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.
b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.10 WARRANTY

A. Manufacturer's Warranty: Furnish manufacturer's written material and labor warranty signed by an authorized representative using manufacturer's standard form agreeing to furnish materials and labor required to repair or replace work which exhibits material defects caused by manufacture or design and installation of product. "Defects" is defined to include but not limited to deterioration or failure to perform as required.
1. Warranty Period: Manufacturer shall warrant the products to be free from material and labor Defects for a period of 10 years from date of Substantial Completion.

B. Installer's Warranty: Furnish installer's written workmanship warranty signed by an authorized representative using installer's standard form agreeing to provide labor required to repair or replace work which exhibits workmanship defects. "Defects" is defined to include but not limited to deterioration or failure to perform as required.
1. Warranty Period: Installer shall warrant the installation to be free from workmanship Defects for a period of 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer, including all flashings, sealants (related to the weather barrier), membranes, accessories.

2.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate

expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 283 ASTM E 783 or ASTM E 2357.

2.3 VAPOR-PERMEABLE MEMBRANE AIR-BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Synthetic Polymer Membrane:
1) GCP Applied Technologies; Perm-A-Barrier VPL50RS.
2) Henry Company; Air-Bloc 17MR.
2. Physical and Performance Properties:
a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
b. Vapor Permeance: Minimum 10 perms; ASTM E 96/E 96M.
c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.

2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Butyl Strip: Vapor retarding, 30 to 40 mils thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.

D. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.

E. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

F. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

G. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

H. Modified Bituminous Transition Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

I. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Dow Corning Corporation; 123 Silicone Seal.
b. Pecora Corporation; Sil-Span.
c. Tremco Incorporated, an RPM company; Spectrem Simple Seal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

E. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
   1. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.4 TRANSITION STRIP INSTALLATION

A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
   1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
   2. Install butyl strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip preformed silicone-sealant extrusion so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
   1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
   2. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

E. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

F. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

G. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, strip.

H. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.5 FLUID AIR-BARRIER MEMBRANE INSTALLATION

A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.
   1. Apply primer to substrates at required rate and allow it to dry.
   2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.
   1. Vapor-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil dry film thickness.

C. Apply strip and transition strip a minimum of 1 inch onto cured air-barrier material or strip and transition strip over cured air-barrier material overlapping 3 inches onto each surface according to air-barrier manufacturer's written instructions.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.6 FIELD QUALITY CONTROL

A. Manufacture Inspection Report: Manufacture representative to visit site during the installation of air barrier system and provide field reports to contractor and architect identifying installation of the air barrier system is installed per manufacture’s requirements.
   1. Inspection intervals to include the following:
      a. Review of substrate conditions prior to installation
      b. Review of mock-up installation
      c. Review at initial start of installation
      d. Review installation progress at bi-weekly intervals
      e. Review at completion of installation
   2. Report to include records of wet film MIL thickness during installation to ensure the final dry film MIL thickness is being provided.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
   1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
   2. Continuous structural support of air-barrier system has been provided.
   3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
   4. Site conditions for application temperature and dryness of substrates have been maintained.
   5. Maximum exposure time of materials to UV deterioration has not been exceeded.
   6. Surfaces have been primed, if applicable.
   7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
   8. Strips and transition strips have been firmly adhered to substrate.
   9. Compatible materials have been used.
   10. Transitions at changes in direction and structural support at gaps have been provided.
   11. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
   12. All penetrations have been sealed.

C. Air barriers will be considered defective if they do not pass inspections.
   1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
   2. Remove and replace deficient air-barrier components for retesting as specified above.

3.7 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
   1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If air-barrier system is exposed to these UV conditions for more than number of days recommended by the manufacturer, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
   2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26

SECTION 07 42 13.13 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Concealed-fastener, lap-seam metal wall panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
   4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
   5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
   6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
   7. Review temporary protection requirements for metal panel assembly during and after installation.
   8. Review of procedures for repair of metal panels damaged after installation.
   9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer’s data sheets, for specified products.
   1. Include data indicating compliance with performance requirements.
   2. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings: Provide shop drawings prepared by manufacturer or manufacturer's authorized Installer.
   1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
   2. Indicate details of fastening, including clip spacing, supported by load span tables that include an evaluation of clip and panel side joint interaction.
   3. Include full elevations showing openings and penetrations. Include details of each condition of installation and attachment.
   4. Provide details at a minimum scale of 1-1/2-inch per foot (1:8) of all required trim and extrusions needed for a complete installation.
   5. Indicate points of supporting structure that must coordinate with metal wall panel assembly installation.

C. Samples for Verification: Provide 12-inch section of panel(s) showing finishes. Provide 12-inch long pieces of trim pieces and other exposed components.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Qualification Information: For Installer firm.

C. Manufacturer's warranty: Submit sample warranty.

D. Manufacturer’s Field Service Inspection Report

1.6 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.7 QUALITY ASSURANCE

A. Manufacturer/Source: Provide metal wall panel and panel accessories from a single manufacturer.

B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum 10 years experience in manufacture of similar products in successful use in similar applications.

C. Installer Qualifications:
1. An entity that employs installers and supervisors who are trained and approved by manufacturer.
2. Experienced Installer with minimum of 5 years experience with successfully completed projects of a similar nature and scope.

D. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

E. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical metal panel assembly, including corner, supports, attachments, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
1. Wind Loads: As indicated on Drawings.
2. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
1. Test-Pressure Difference: 1.57 lbf/sq. ft.

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.

B. Concealed-Fastener Metal Wall Panels : Formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Centria.
b. MBCI; a division of NCI Building Systems, L.P.
c. Metl-Span.
2. Basis of Design: Refer to Architect’s Master Schedule
3. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
a. Nominal Thickness: As indicated in Architect’s Master Schedule.
b. Exterior Finish: Two-coat fluoropolymer.
1) Color: As indicated in Architect’s Master Schedule.
4. Panel Coverage: As indicated in Architect’s Master Schedule.
5. Panel Height: As indicated in Architect’s Master Schedule.

2.3 UNDERLAYMENT MATERIALS

A. Refer to Section 7 27 26 “Fluid-Applied Membrane Air Barriers.”

B. Refer to Section 07 62 10 “Flexible Flashing.”

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.6 METAL WALL PANEL ACCESSORIES

A. Metal Wall Panel Accessories, General: Provide complete metal wall panel assembly incorporating trim, copings, fasciae, parapet caps, soffits, sills, inside and outside corners, and miscellaneous flashings. Provide manufacturer's factory-formed clips, shims, flashings, lap tapes, and closure strips for a complete installation. Fabricate and install accessories in accordance with SMACNA Manual.

2.7 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:
1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Shim or otherwise plumb substrates receiving metal panels.

2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:
1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Flash and seal panels with weather closures at perimeter of all openings.

E. Watertight Installation:
1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal wall panel installation, including accessories.

B. Remove and replace metal wall panels where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare inspection reports.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.13

SECTION 07 42 43 - ALUMINUM COMPOSITE PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes metal composite material wall panels, installed using rain screen method of installation

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, metal composite material panel Installer, metal composite material panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal composite material panels, including installers of doors, windows, and louvers.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review methods and procedures related to metal composite material panel installation, including manufacturer's written instructions.
   4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
   5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal composite material panels.
   6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
   7. Review temporary protection requirements for metal composite material panel assembly during and after installation.
   8. Review procedures for repair of panels damaged after installation.
   9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:
   1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
   2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
   1. Metal Composite Material Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal composite material panel accessories.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal composite material panel assembly as shown on Drawings, including corner, supports, attachments, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal composite material panels, and other manufactured items so as not to be damaged or deformed. Package metal composite material panels for protection during transportation and handling.

B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive slope for drainage of water. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal composite material panels during installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.7 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite material panels to be performed according to manufacturers' written instructions and warranty requirements.

1.8 COORDINATION

A. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material panel systems that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum panel rainscreen system with a back ventilated cavity of 2” to assure adequate ventilation to minimize condensation. The cavity shall further allow proper airflow under UV exposure; pressure equalization drainage and back ventilation shall be achieved and maintained by panel system.

B. Delegated Design: Design aluminum wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of wall area when tested according to ASTM E 283 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (75 Pa)

D. Water Penetration Under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 12 lbf/sq. ft. (137 Pa)

E. Water Penetration Under Dynamic Pressure: No evidence of water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft.

F. Water Leakage: Uncontrolled water infiltrating the system or appearing on system's normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

G. Structural Performance: Provide aluminum wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
1. Design Wind Loads: As indicated on structural drawings or as otherwise determined using design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) (10 m) , according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure."
2. Deflection Limits: Aluminum wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/175 of the span. Deflection of 3 mm aluminum panels limited to L/60.

H. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C) ambient; 180 deg F (100 deg C) material surfaces.

I. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 METAL COMPOSITE MATERIAL WALL PANELS

A. Metal Composite Material Wall Panel Systems: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components, panel stiffeners, and accessories required for weathertight system.
1. Products: Subject to compliance with requirements, provide one of the following:
a. 3A Composites USA, Inc.; Alucobond Plus.
b. Alcoa Inc.; Reynobond FR.
c. Alpolic; Alpolic FR.
d. CENTRIA Architectural Systems; Formabond Wall System.
e. Larson Composite Panel; Alucoil

B. Aluminum-Faced Composite Wall Panels : Formed with 0.020-inch- thick, coil-coated aluminum sheet facings.
1. Panel Thickness: 0.157 inch.
2. Core: Fire retardant.
3. Exterior Finish: Two-coat fluoropolymer .
a. Color: As indicated by manufacturer's designations.

C. Attachment Assembly Components: Formed from extruded aluminum.

D. Attachment Assembly: Rainscreen principle system.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal composite material panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal composite material panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal composite material panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal composite material panels and remain weathertight; and as recommended in writing by metal composite material panel manufacturer.

2.4 FABRICATION

A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal composite material panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
   3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
   4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
   5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
   6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
      a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:
1. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material panel supports, and other conditions affecting performance of the Work.
1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal composite material wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal composite material wall panel manufacturer.
a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
b. Repair abandoned fastener holes, over driven fasteners, or other damage to the weather barrier.
3. All metal panel accessories are to be fastened into stud framing. Where stud framing is not provided as the accessory back–up (such as flashings or horizontally oriented accessories), indicate that additional metal strapping is to be provided for support of the accessory fasteners. Also incorporate verbiage indicating that the flashing elements are to be stripped-in with the weather barrier system.
a. All abandoned fasteners or fasteners that miss proper back up framing are to undergo repairs to the air barrier.

B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify actual locations of penetrations relative to seam locations of metal composite material panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal composite material panel manufacturer's written recommendations.

3.3 METAL COMPOSITE MATERIAL PANEL INSTALLATION

A. General: Install metal composite material panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Shim or otherwise plumb substrates receiving metal composite material panels.
2. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal composite material panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal composite material panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal composite material panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support metal composite material wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

E. Installation: Attach metal composite material wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.
1. Rainscreen Systems: Do not apply sealants to joints unless otherwise indicated.

F. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-returned flanges of wall panels to panel clips with manufacturer's standard fasteners.
1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 07 92 00 "Joint Sealants."

G. Rainscreen-Principle Installation: Install using manufacturer's standard assembly with vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach metal composite material wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.
1. Install wall panels to allow individual panels to be installed and removed without disturbing adjacent panels.
2. Do not apply sealants to joints unless otherwise indicated.

H. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.

I. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

A. Water-Spray Test: After installation, test area of assembly as directed by Architectfor water penetration according to AAMA 501.2.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal composite material wall panel installation, including accessories.

C. Metal composite material wall panels will be considered defective if they do not pass test and inspections.

D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.

B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 52 16 - STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Styrene-butadiene-styrene (SBS)-modified bituminous membrane “cool roof” roofing.
2. Roof insulation.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For components of membrane roofing system, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Research/Evaluation Reports: For components of membrane roofing system, from ICC-ES.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is FM Global approved for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
   1. Special warranty includes membrane roofing, base flashings, fasteners, substrate board, and other components of roofing system.
   2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products, for the following warranty period:
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Elevate by Holcim.
   2. Johns Manville.
   3. Siplast, Inc.
   4. Soprema

B. Source Limitations: Obtain components including roof insulation fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
   1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
   2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Tested by a qualified testing agency to resist uplift pressures as indicated on Drawings.

D. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
1. Fire/Windstorm Classification: Class 1A-90
2. Hail-Resistance Rating: MH.

E. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

F. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.3 ROOFING SHEET MATERIALS

A. Glass-Fiber Base-Ply Sheet: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt.

B. Granule-Surfaced Roofing Cap Sheet: ASTM D 6164/D 6164M, Grade G, Type I or II, SBS-modified asphalt sheet (reinforced with fibrous glass mat fabric); granule surfaced; suitable for application method specified, and as follows:
1. Granule Color: White.

2.4 BASE FLASHING SHEET MATERIALS

A. Backer Sheet: ASTM D 6164/D 6164M, Grade S, Type I or II, SBS-modified asphalt sheet (reinforced with fibrous glass mat fabric); smooth surfaced; suitable for application method specified.

B. Granule-Surfaced Flashing Sheet: ASTM D 6164/D 6164M, Grade G, Type I or II, SBS-modified asphalt sheet (reinforced with polyester fabric) ASTM D 6163, Grade G, Type I or II, SBS-modified asphalt sheet (reinforced with glass fibers) ASTM D 6162, Grade G, Type I or II, SBS-modified asphalt sheet (reinforced with a combination of polyester fabric and glass fibers); granule surfaced; suitable for application method specified, and as follows:
1. Granule Color: Match primary roof color.

2.5 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Asphalt Primer: ASTM D 41/D 41M.

C. Roofing Asphalt: ASTM D 312, Type III.

D. Roofing Asphalt: ASTM D 6152, SEBS modified.

E. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.

F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.

G. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

I. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve, color to match roofing.

J. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

2.6 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Global-approved roof insulation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Atlas Roofing Corporation.
      b. Carlisle SynTec Incorporated.
      c. Elevate.
      d. GAF Materials Corporation.
      e. Johns Manville.
      f. Rmax, Inc.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.7 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Insulation Cant Strips: ASTM C 728, perlite insulation board.

D. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick, factory primed.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corporation; GlasRoc Sheathing Type X.
      b. Georgia Pacific Corporation; Dens Deck Prime.
      c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
      d. USG Corporation; Securock Glass Mat Roof Board.

2.8 WALKWAYS

A. Walkway Pads: Reinforced asphaltic composition pads with slip-resisting mineral-granule surface, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 3/8 inch thick, minimum.
   1. Pad Size: Manufacturer's standard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
   1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
   2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."
   4. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane relative to adjoining deck.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal./100 sq. ft., and allow primer to dry.

D. Install insulation strips in ribs of acoustical roof decks according to acoustical roof deck manufacturer's written instructions.

3.3 INSTALLATION, GENERAL

A. Comply with roofing system manufacturer's written instructions.

B. Asphalt Heating: Heat asphalt to its equiviscous temperature, measured at the mop cart or mechanical spreader immediately before application. Circulate asphalt during heating. Do not raise asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed asphalt manufacturer's recommended temperature limits during asphalt heating. Do not heat asphalt within 25 deg F of flash point. Discard asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.
1. Apply hot roofing asphalt within plus or minus 25 deg F of equiviscous temperature.

C. Asphalt Heating: Heat and apply SEBS-modified roofing asphalt according to roofing system manufacturer's written instructions.

D. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.4 INSULATION INSTALLATION

A. Install one lapped base-sheet course and mechanically fasten to substrate according to roofing system manufacturer's written instructions.

B. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 45 degrees.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation with long joints of insulation in a continuous straight line, with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

E. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

H. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft., and allow primer to dry.
2. Set each layer of insulation in a solid mopping of hot roofing asphalt.

I. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
1. Fasten insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

J. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck. Tape joints if required by roofing system manufacturer.
   1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
   2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
   3. Apply hot roofing asphalt to underside, and immediately bond cover board to substrate.

3.5 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
   1. Install roofing system MBS -2 -I -[T] [M] [L], according to roof assembly identification matrix and roof assembly layout illustrations in NRCA's "The NRCA Roofing and Waterproofing Manual" and to Section requirements.

B. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:
   1. Deck Type: I (insulated).
   2. Adhering Method: L (cold-applied adhesive).
   3. Number of SBS-Modified Asphalt Sheets: One.
   4. Surfacing Type: M (mineral-granule-surfaced cap sheet).

C. Start installation of roofing in presence of manufacturer's technical personnel.

D. Where roof slope exceeds 1/2 inch per 12 inches, install roofing membrane sheets parallel with slope.
   1. Backnail roofing sheets to nailer strips according to roofing system manufacturer's written instructions.

E. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
   1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
   2. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.
   3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.6 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

A. Install modified bituminous roofing cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
   1. Adhere to substrate in cold-applied adhesive.
   2. Unroll roofing sheets and allow them to relax for minimum time period required by manufacturer.

B. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
   1. Repair tears and voids in laps and lapped seams not completely sealed.
   2. Apply roofing granules to cover exuded bead at laps while bead is hot.

C. Install roofing sheets so side and end laps shed water.

3.7 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
   1. Prime substrates with asphalt primer if required by roofing system manufacturer.
   2. Backer-Sheet Application: Mechanically fasten backer sheet to walls or parapets. Adhere backer sheet over roofing membrane at cants in a solid mopping of hot roofing asphalt cold-applied adhesive.

3. Backer-Sheet Application: Adhere backer sheet to substrate in a solid mopping of hot roofing asphalt cold-applied adhesive.
4. Flashing-Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F. Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer.
5. Flashing-Sheet Application: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer.
6. Flashing-Sheet Application: Adhere flashing sheet to substrate in asphalt roofing cement at rate required by roofing system manufacturer.
7. Flashing-Sheet Application: Torch apply flashing sheet to substrate.

B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
1. Seal top termination of base flashing.

D. Install roofing cap-sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.

E. Roof Drains: Set 30-by-30-inch- metal flashing in bed of asphaltic adhesive on completed roofing membrane. Cover metal flashing with roofing cap-sheet stripping, and extend a minimum of 4 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
1. Install stripping according to roofing system manufacturer's written instructions.

3.8 WALKWAY INSTALLATION

A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size, according to walkway pad manufacturer's written instructions.
1. Set walkway pads in cold-applied adhesive.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
1. Infrared Thermography: Testing agency surveys entire roof area using infrared color thermography in accordance with ASTM C1153.
a. Perform tests before overlying construction is placed.
b. After infrared scan, locate specific areas of leaks by electrical capacitance/impedance testing, or by nuclear hydrogen detection testing.
c. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
d. Testing agency to prepare survey report of initial scan indicating locations of entrapped moisture if any.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

C. Roofing system will be considered defective if it does not pass tests and inspections.
1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: <**Insert name of Owner**>.
2. Address: <**Insert address**>.
3. Building Name/Type: <**Insert information**>.
4. Address: <**Insert address**>.
5. Area of Work: <**Insert information**>.
6. Acceptance Date: _____.
7. Warranty Period: <**Insert time**>.
8. Expiration Date: _____.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
   a. lightning;
   b. peak gust wind speed exceeding <**Insert** mph>;
   c. fire;
   d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
   e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
   f. vapor condensation on bottom of roofing; and
   g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 07 52 16

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Formed low-slope roof sheet metal fabrications.
2. Formed wall sheet metal fabrications.
3. Formed equipment support flashing.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.
1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Include stamped engineering drawing for metal coping.
13. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
1. Construct typical lap splice or seam for mechanically-jointed systems, and solder lap or seam for field-solderable systems.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested FM Approvals approved.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.7 WARRANTY

A. All roofing-related sheet metal, including mechanical, plumbing, and electrical flashings be constructed under the roofing contract and included within the roofing warranty.

B. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 30 years from date of Substantial Completion.

C. Installer’s Special Warranty: Provide workmanship warranty for sheet metal flashing and trim related to roofing.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-120 . Identify materials with name of fabricator and design approved by FM Approvals.

D. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
1. Design Pressure: As indicated on Drawings .

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
1. Exposed Coil-Coated Finish:
a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color: As selected by Architect from manufacturer's full range.

3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:
a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Color: As selected by Architect from manufacturer's full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

A. Refer to High-Temperature Underlayment in section 07 62 10 – Flexible Flashing.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:
1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
5. Where counter flashing profiles are required, provide two-piece profile so that reroofing can be performed without removal of the adjacent cladding system. Lap, rivet, and seal all counterflashing corners.
6. Sheet metal flashing is required to terminate roofing in all locations, all termination bar and roofing terminations must be flashed with sheet metal including transitions between adjacent flashings at differing elevations (i.e., coping to counterflashing transitions, etc.). Contractor shall install necessary corner/transition flashings as required for continuous system. This includes cladding transitions as well.
7. Fabricate cleats one gauge heavier than the flashing metal. Comply with the requirements of ANSI/SPRI ES-1 and SMACNA Architectural Sheet Metal Manual for metal thickness, joinery, and profile.
8. Rivet all non-moving seams in sheet metal systems. Indicate that butyl sealant may be concealed within metal joints and silicone for exposed metal joints.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.Rivet joints where necessary for strength.

J. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

K. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Base Flashing: Fabricate from the following materials:
1. Aluminum: 0.040 inch thick.

B. Counterflashing: Fabricate from the following materials:
1. Stainless Steel: 24 gauge, 0.025 inch thick.

C. Flashing Receivers: Fabricate from the following materials:
1. Aluminum: 0.032 inch thick.

D. Roof-Penetration Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch thick.

2.7 WALL SHEET METAL FABRICATIONS

A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
   1. Stainless Steel: 26 gauge, 0.0187 inch thick.

B. Wall Expansion-Joint Cover: Fabricate from the following materials:
   1. Stainless Steel: 24 gauge, 0.025 inch thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners[**, solder**], protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
   4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
   5. Torch cutting of sheet metal flashing and trim is not permitted.
   6. Do not use graphite pencils to mark metal surfaces.
   7. Provide continuous cleats, in lieu of, spacing cleats no more than 12-inches apart and that the coping/edge flashings comply with ANSI/SPRI ES-1 or follow guidelines utilized in tested assemblies. The tested assemblies in ANSI/SPRI ES-1 also have requirements for coping and cleat fastener spacing. The specified fastener spacing is generally too wide when compared to the standard tested assemblies.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
   1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
3. Integrate coping underlayment with the weather barrier. Where TPO roofing is used, bring TPO membrane up and over parapet and integrate with air barrier.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
1. Pipe counter flashing height to be a minimum of 8” from base flashing.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 62 10 - FLEXIBLE FLASHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Concealed flashing within wall assemblies to protect and shed incidental water to the exterior.

1.3 QUALITY REQUIREMENTS

A. Flexible flashing materials to be single sourced with the weather barrier system.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store flashing materials in contact with other materials that might cause staining, denting, or other surface damage. Store flashing materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.1 WARRANTY

A. Provide manufacturer’s standard 5-year material warranty.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Flashing and trim assemblies as indicated shall withstand structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed flashing shall not leak, or loosen, and shall remain watertight.

2.2 SELF-ADHERED FLEXIBLE SHEET FLASHING

A. Self-Adhesive flexible flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 40 mils.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. GCP Applied Technologies; Perm-A-Barrier Detail Membrane.
      b. Henry; Blueskin TWF.

2.1 FLUID APPLIED FLASHING

A. Liquid, high-performance, medium modulus, UV stable, non-sag polyurethane sealant. Using fan tip apply 40 mil sealant to rough openings. Rough opening perimeters for fenestration/window, door and curtain wall applications.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. GCP Applied Technologies.
      b. Henry

2.2 HIGH TEMPERATURE FLASHING

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing. Provide primer according to written recommendations of underlayment manufacturer if needed.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. GCP Applied Technologies.; Ultra.
      b. Henry Company; Blueskin PE200 HT.
   2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
   3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, separators, sealants, and other miscellaneous items as required for complete metal flashing installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FLASHING INSTALLATION

A. General: Install as indicated on Drawings and per Manufacturer’s recommendations.

B. Self-Adhering Sheet Flashing: Install self-adhering sheet flashing, wrinkle free. Apply primer if required by flashing manufacturer. Comply with temperature restrictions of flashing manufacturer for installation. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover flashing with subsequent construction within 14 days.

C. Location:
   1. Flexible Flashing: As indicated on drawings, or at all exterior windows, doors or other penetrations where high temperature flashing is not required.
   2. High Temperature Flashing: As indicated on drawings, or at all locations where flashing will be in contact with metal coping or metal panels where high temperatures exist.

END OF SECTION

SECTION 07 71 00 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Copings.
   2. Roof-edge specialties.
   3. Roof-edge drainage systems.
   4. Reglets and counterflashings.

B. Preinstallation Conference: Conduct conference at Project site
   1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
   2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
   3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.
   1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
   2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
   3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
   4. Detail termination points and assemblies, including fixed points.
   5. Include details of special conditions.
   6. Include laps and splice details.

C. Samples: For each type of roof specialty and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of roof specialty.

A. Product Test Reports: For copings and roof-edge flashings, for tests performed by a qualified testing agency, verifying ANSI SPRI ES 1 requirements have been met.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.7 WARRANTY

A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Roofing Section .

B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. SPRI Wind Design Standard: Manufacture and install copings and roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:
1. Design Pressure: As indicated on Drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range):120 deg F, ambient; 180 deg F , material surfaces.

2.2 COPINGS

A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following]:
a. Hickman Company, W. P.
b. Merchant & Evans, Inc.
c. Metal-Era, Inc.
d. Petersen Aluminum Corporation.
2. Formed Aluminum Sheet Coping Caps: Aluminum sheet, 0.063 inch thick minimum, or thickness as required to meet performance requirements.
a. Surface: Smooth, flat finish.
b. Finish: Two-coat fluoropolymer.
c. Color: As selected by Architect from manufacturer's full range.
3. Corners: Factory mitered and mechanically clinched and sealed watertight.
4. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.
a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.
b. Face-Leg Cleats: Concealed, continuous galvanized-steel sheet.

2.3 ROOF-EDGE SPECIALTIES

A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous metal receiver with integral drip-edge cleat to engage fascia cover and secure single-ply roof membrane. Provide matching corner units.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hickman Company, W. P.
      b. Metal-Era, Inc.
      c. Metal-Fab Manufacturing, LLC.
      d. Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.
   2. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, thickness as required to meet performance requirements.
      a. Surface: Smooth, flat finish.
      b. Finish: Two-coat fluoropolymer.
      c. Color: As selected by Architect from manufacturer's full range.
   3. Corners: Factory mitered and mechanically clinched and sealed watertight.
   4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
   5. Receiver: Galvanized-steel sheet, nominal 0.040-inch thickness.

2.4 ROOF-EDGE DRAINAGE SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Architectural Products Company.
   2. ATAS International, Inc.
   3. Berger Building Products, Inc.
   4. Castle Metal Products.
   5. Cheney Flashing Company.
   6. CopperCraft by FABRAL; a Euramax company.
   7. Hickman Company, W. P.
   8. Merchant & Evans, Inc.
   9. Metal-Era, Inc.
   10. Metal-Fab Manufacturing, LLC.
   11. Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.

B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
   1. Aluminum Sheet: Aluminum sheet, thickness as required to meet performance requirements .
   2. Gutter Profile: Style A according to SMACNA's "Architectural Sheet Metal Manual."
   3. Corners: Factory mitered and mechanically clinched and sealed watertight.
   4. Gutter Supports: Gutter brackets with finish matching the gutters.

C. Downspouts: Plain rectangular complete with machine-crimped elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
   1. Formed Aluminum: Aluminum sheet, thickness as required to meet performance requirements

D. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scuppers.
   1. Formed Aluminum: Aluminum sheet, thickness as required to meet performance requirements

E. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge, and of dimensions and shape indicated, complete with outlet tube that nests into upper end of downspout, exterior flange trim,.
   1. Formed Aluminum: Aluminum sheet, thickness as required to meet performance requirements

F. Splash Pans:
   1. Concrete, or as indicated on drawings.

G. Aluminum Finish: Two-coat fluoropolymer.
   1. Color: As selected by Architect from manufacturer's full range.

2.5 REGLETS AND COUNTERFLASHINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Castle Metal Products.
2. Cheney Flashing Company.
3. Fry Reglet Corporation.
4. Heckmann Building Products Inc.
5. Hickman Company, W. P.
6. Keystone Flashing Company, Inc.
7. Metal-Era, Inc.
8. Metal-Fab Manufacturing, LLC.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
1. Zinc-Coated Steel: Nominal 0.022-inch thickness.
2. Corners: Factory mitered and mechanically clinched and sealed watertight.
3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Stucco Type, Embedded: Provide reglets with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
5. Concrete Type, Embedded: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
6. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:
1. Zinc-Coated Steel: Nominal 0.022-inch thickness.
2. Copper: 16 oz./sq. ft..

D. Accessories:
1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

E. Zinc-Coated Steel Finish: Two-coat fluoropolymer.
1. Color: As selected by Architect from manufacturer's full range.

2.6 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing. Provide primer according to written recommendations of underlayment manufacturer if needed.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.
b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
c. Henry Company; Blueskin PE200 HT.
2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

B. Underlayment membrane must be single sourced with air barrier and flexible flashing materials for single warranty.

2.7 MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.

2.8 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
   1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
   2. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
   3. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
   4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
   5. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.

B. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.9 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Coil-Coated Galvanized-Steel Sheet Finishes:
   1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with ASTM A 755/A 755M and coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

E. Coil-Coated Aluminum Sheet Finishes:
   1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
   1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
   2. Provide uniform, neat seams with minimum exposure of solder and sealant.
   3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
   4. Torch cutting of roof specialties is not permitted.
   5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
   1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
   2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.3 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.
   1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at 30-inch centers.
   2. Interlock face-leg drip edge into continuous cleat anchored to substrate at 24-inch centers . Anchor back leg of coping with screw fasteners and elastomeric washers at 24-inch centers.

3.4 ROOF-EDGE SPECIALITIES INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.5 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
   1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion-joint caps.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
   1. Provide elbows at base of downspouts at grade to direct water away from building.
   2. Connect downspouts to underground drainage system indicated.

D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in elastomeric sealant.

E. Parapet Scuppers: Install scuppers through parapet where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
   1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
   2. Loosely lock front edge of scupper with conductor head.
   3. Seal or solder exterior wall scupper flanges into back of conductor head.

F. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch below scupper discharge.

3.6 REGLET AND COUNTERFLASHING INSTALLATION

A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.

C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

SECTION 07 71 29 - MANUFACTURED ROOF EXPANSION JOINTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Aluminum roof expansion joints.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For roof expansion joints.
1. Include plans, elevations, sections, and attachment details.
2. Include details of splices, intersections, transitions, fittings, method of field assembly, and location and size of each field splice.
3. Provide isometric drawings of intersections, terminations, and changes in joint direction or planes, depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.
4. .

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire-barrier provided as part of a roof-expansion-joint assembly, for tests performed by a qualified testing agency.

B. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer of roofing membrane.

1.7 WARRANTY

A. Special Warranty: Manufacturer and Installer agree to repair or replace roof expansion joints and components that leak, deteriorate beyond normal weathering, or otherwise fail in materials or workmanship within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof expansion joints that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
a. Color fading more than five Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SUSTAINABILITY REQUIREMENTS

A. Low Emitting Requirements: Provide product that meets low emitting criteria listed in section 01 81 13.02 – Sustainable Design Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. General: Roof expansion joints shall withstand exposure to weather, remain watertight, and resist the movements indicated without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint seals, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.1 ALUMINUM ROOF EXPANSION JOINTS

A. Aluminum Roof Expansion Joint: Manufactured, continuous, waterproof, joint-cover assembly; consisting of a formed or extruded metal cover secured to extruded aluminum frames, with water-resistant gasketing between cover and frames, and with provision for securing assembly to substrate and sealing assembly to roofing membrane or flashing. Provide each size and type indicated[, factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints], splicing units, adhesives, and other components as recommended by roof-expansion-joint manufacturer for complete installation. Fabricate each assembly specifically for installation configuration indicated on Drawings.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
      b. Balco, Inc.
      c. C/S Group.
      d. InPro Corporation.
      e. MM Systems Corporation.
      f. Nystrom Building Products.
      g. Watson Bowman Acme Corp.
   2. Joint Movement Capability: Plus and minus 25 percent of joint size.
   3. Frame Members: Extruded aluminum configured for curbs or sloped cants as indicated on Drawings; with exposed finish matching cover.
   4. Cover: Formed or extruded aluminum; thickness as recommended by manufacturer.
      a. Aluminum Finish Color: As selected by Architect from manufacturer's full range.
   5. Centering Devices: Centering bars or snap-on spring clips attached to the cover.
   6. Secondary Seal: Continuous, waterproof membrane within joint and attached to substrate on sides of joint below the cover.
   7. Fire Barrier: Manufacturer's standard fire-resistive joint system with ratings determined per ASTM E 1966 or UL 2079 to resist spread of fire and accommodate building thermal movements without impairing its ability to resist the passage of fire and hot gases.
      a. Fire-Resistance Rating: Not less than fire-resistance rating of the roof assembly.

2.2 MATERIALS

A. Galvanized-Steel Sheet: ASTM A 653/A 653M, hot-dip zinc-coating designation G90.

B. Aluminum: ASTM B 209 for sheet and plate, ASTM B 221 for extrusions; alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
   1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious or preservative-treated wood materials.
   2. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer: System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

C. EPDM Membrane: ASTM D 4637, Type standard with manufacturer for application.

D. Neoprene Membrane: Neoprene sheet recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil; and as standard with roof-expansion-joint manufacturer for application.

E. PVC Membrane: ASTM D 4434, Type standard with manufacturer for application.

F. Silicone Extrusions: ASTM D 2000, UV stabilized, and that does not propagate flame.

G. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
   1. Exposed Fasteners: Gasketed. Use screws with hex washer heads matching color of material being fastened.

H. Mineral-Fiber Blanket: ASTM C 665.

I. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine roof-joint openings, inside surfaces of parapets, and expansion-control joint systems that interface with roof expansion joints, for suitable conditions where roof expansion joints will be installed.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for handling and installing roof expansion joints.
   1. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.
   2. Install roof expansion joints true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
   3. Provide for linear thermal expansion of roof expansion joint materials.
   4. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
   5. Provide uniform, neat seams.
   6. Install roof expansion joints to fit substrates and to result in watertight performance.
   7. Torch cutting of roof expansion joints is not permitted.
   8. Do not use graphite pencils to mark aluminum surfaces.

B. Directional Changes and Other Expansion-Control Joint Systems: Coordinate installation of roof expansion joints with other expansion-control joint systems to result in watertight performance. Install factory-fabricated units at directional changes and at transitions between roof expansion joints and exterior expansion-control joint systems specified in Section 07 95 00 "Expansion Control" to provide continuous, uninterrupted, and watertight joints.

C. Splices: Splice roof expansion joints with materials provided by roof-expansion-joint manufacturer for this purpose, to provide continuous, uninterrupted, and waterproof joints.
   1. Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.

D. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

3.3 PROTECTION

A. Protect roof expansion joints from foot traffic, displacement, or other damage.

B. Remove and replace roof expansion joints and components that become damaged by moisture or otherwise.

END OF SECTION 07 71 29

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Roof hatches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Manufacturer Compliance Letter: Signed by roof accessory manufacturer, stating that materials and units supplied comply with requirements.

1.4 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.5 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

A. Manufacturer Warranty, product: Standard 5 year warranty for structural defective material.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation and mill phosphatized for field painting where indicated.
   1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
   2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

B. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Glass-Fiber Board Insulation: ASTM C 726, thickness as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Underlayment:
   1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
   2. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.
   3. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
   1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
   2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
   3. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
   4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

J. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated single -walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Babcock-Davis.
      b. Bilco Company (The).
      c. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
      d. Nystrom.
      e. O'Keeffe's Inc.

B. Type and Size: Single-leaf lid, refer to Drawings for size.

C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.

D. Hatch Material: Zinc-coated (galvanized) steel sheet, 0.079 inch thick.
   1. Finish: Mill phosphatized .

E. Construction:
1. Insulation: Glass-fiber board.
2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
3. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
4. Fabricate curbs to minimum height of 12 inches unless otherwise indicated.

F. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
1. Height: 42 inches above finished roof deck.
2. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inchesin diameter.
3. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
4. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
5. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
6. Fabricate joints exposed to weather to be watertight.
7. Fasteners: Manufacturer's standard, finished to match railing system.
8. Finish: Manufacturer's standard.
a. Color: As selected by Architect from manufacturer's full range.

H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches above finished roof deck.
3. Material: Steel tube.
4. Post: 1-5/8-inch- diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat.
a. Color: As selected by Architect from manufacturer's full range.

A. Vertical Ladder Lifeline Kit: Fall protection system allowing for continuous movement for entire height of ladder without disconnecting for new tie-off points. Complies with OSHA 1910.28 and ANSI Z359.16.
1. Location: Provide at roof-access ladders over 24-feet.
2. Material: Stainless-steel.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
1. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof-Hatch Installation:
1. Install roof hatch so top surface of hatch curb is level.
2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
3. Attach safety railing system to roof-hatch curb.
4. Attach ladder-assist post according to manufacturer's written instructions.

D. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 09 91 00 " Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.
   3. Penetrations in smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
   1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
   1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
      a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
      b. Classification markings on penetration firestopping correspond to designations listed by the following:
         1) UL in its "Fire Resistance Directory."

C. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hilti, Inc.
2. RectorSeal Corporation.
3. Specified Technologies Inc.
4. 3M Fire Protection Products.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. Fire-resistance-rated walls include fire walls fire-barrier walls smoke-barrier walls and fire partitions.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. Horizontal assemblies include floors floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
1. Permanent forming/damming/backing materials, including the following:
   a. Slag-wool-fiber or rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Fillers for sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

D. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

G. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Penetration firestopping to be installed to maintain wall and horizontal rating requirements as indicated on drawings.

END OF SECTION 07 84 13

SECTION 07 84 46 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

B. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
a. Fire-resistive joint system products bear classification marking of qualified testing agency.
b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
1) UL in its "Fire Resistance Directory."

C. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
   1. Joints include those installed in or between fire-resistance-rated walls floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
   2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
   3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hilti, Inc.
      b. RectorSeal Corporation.
      c. Specified Technologies Inc.
      d. 3M Fire Protection Products.

C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079.
   1. L-Rating: Not exceeding 5.0 cfm/ft of joint at 0.30 inch wg at both ambient and elevated temperatures.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hilti, Inc.
      b. RectorSeal Corporation.
      c. Specified Technologies Inc.
      d. 3M Fire Protection Products.

D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
   1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
   2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

B. Refer to Drawings for specific scheduled applications.

END OF SECTION 07 84 46

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Nonstaining silicone joint sealants.
2. Mildew-resistant joint sealants.
3. Butyl joint sealants.
4. Latex joint sealants.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer

B. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

C. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

D. Field-Adhesion-Test Reports: For each sealant application tested.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.
1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
1. Install 10 feet of sealant in each type of joint to verify and set quality standards for materials and installation procedures, and to demonstrate aesthetic effects.

D. Sealant Log: provide sealant logs

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less or greater than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Urethane Sealants; Five years from date of Substantial Completion.
2. Warranty Period: Silicone Sealants; Twenty years from date of Substantial Completion

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: Match adjacent substrates unless indicated otherwise.

2.2 SILICONE JOINT SEALANTS

A. Silicone, ASTM C920, Type S, Grade NS, Class 50, Use NT, Nonstaining ASTM C 1248: single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Dow Corning Corporation; 795.
b. GE Construction Sealants; SilPruf NB.
c. Pecora Corporation; 864NST .
d. Tremco Incorporated; Spectrem 2 .
e. Sika Corporation; Silasil WS295.
1. Description: Neutral, one-part silicone sealant.
2. Usage: Structural glazing, steel, anodized aluminum, glass and painted metal.

B. Silicone, ASTM C920, Type S, Grade NS, Class 50, Use NT, Nonstaining ASTM C 124:, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Dow Corning Corporation; 791.
b. GE Construction Sealants.
c. Pecora Corporation.
d. Tremco Incorporated.

e. Sika Corporation.
2. Description: Neutral, one-part silicone sealant.
3. Usage: Steel, anodized aluminum, glass and painted metal, non-porous substrates, curtain walls, fluid-applied air barrier.

C. Silicone, ASTM C920, Type S, Grade NS, Class 25, Use NT, Nonstaining ASTM C 1248:single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Dow Corning Corporation; 758.
b. GE Construction Sealants.
c. Pecora Corporation.
d. Tremco Incorporated.
2. Description: Neutral one part silicone sealant, designed for adhering to low energy surfaces common in sheet or peel and stick weather resistant barriers.
3. Usage: Typical use at self-adhering sheet membrane or flexible flashing with polyethylene surfaces.

D. Silicone, ASTM C920, Type S, Grade NS, Class 100/50, Use NT, Nonstaining ASTM C 1248: single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Dow Corning Corporation; 790.
b. GE Construction Sealants.
c. Pecora Corporation.
d. Tremco Incorporated.
2. Description: Ultra-low-modulus sealant for new and remedial construction joint sealing applications.
3. Usage: Natural stone, concrete, cast stone, CMU, brick and metals where more significant joint movement is anticipated.

E. Silicone, ASTM C920, Type S, Grade NS, Class 50, Use NT, Nonstaining ASTM C 1248: single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Dow Corning Corporation; 756.
b. GE Construction Sealants.
c. Pecora Corporation.
d. Tremco Incorporated.
2. Description: Medium-modulus elastomeric sealant designed for weather-proofing sensitive porous stone and metal panel substrates. Reduced residue rundown or dirt pick up, substrate staining and adheres unprimed to porous and non-porous substrates.
3. Usage: Alternative for natural stone, cast stone, CMU, brick masonry and metal substrates where joint movement of up to +/- 50% is anticipated.

2.3 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Dow Corning Corporation; 786-M White.
b. GE Construction Sealants; SCS1700 Sanitary.
c. Tremco Incorporated; Tremsil 200.
d. Sika Corporation; Sikasil GP.
2. Usage: Seal nonporous surfaces around showers, tubs, sinks and plumbing fixtures where conditions of high humidity and temperature extremes exist. Typical applications include: • Sealing around shower-tub enclosures, tubs, sinks, urinals and whirlpools • Sealing around bathroom fixtures • Waterproofing rimless sinks • Ceramic tile grouting.

2.4 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Pecora Corporation; BA-98.
      b. Sika; SikaLastomer 511
   2. Usage: Concealed mastics, flashings, aluminum thresholds, sill plates.

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Pecora Corporation; AC-20.
      b. Sherwin-Williams Company (The); 850A .
      c. Tremco Incorporated; Tremflex 834.
   2. Usage: General purpose interior and exterior caulking and as a back bedding glazing compound. Use on vinyl, aluminum and wood siding as well as on bathroom and kitchen fixtures.

2.6 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. BASF Construction Chemicals, LLC, Building Systems.
      b. Construction Foam Products, a division of Nomaco, Inc.

B. Backer Rod: ASTM 1330. Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
   1. Dual sealant joint conditions:
      a. At interior sealant joint: Use Type O (Open) at inner line of sealant in two-stage sealant
      b. At Exterior sealant joint: Use Type B (bicellular material with a surface skin) in outer line of sealant.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

D. Weep Tubes to Weep Space Between Inner and Outer Seals on Concrete Panels: Weep and Vent Tubes: Clear plastic (PVC) UV-stable reticulated tubing, minimum ¼-inch (6.35mm) inside diameter, and of length as required to extend between exterior face of sealant and open cavity behind.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
      d. Exterior insulation and finish systems.
   3. Remove laitance and form-release agents from concrete.
   4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.
      b. Glass.
      c. Porcelain enamel.
      d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
   1. Limit priming to areas that will be covered with sealant in the same day. Unless recommended otherwise by the sealant manufacturer, re-prime areas exposed for more than 24 hours.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 DUAL SEALANT JOINT

A. All exterior joint sealants in building envelope around openings and within panel joints to have double line of sealant.

B. At base of all panel joints, provide dual joint sealant with weep tubes for moisture drainage.

C. General Contractor to sequence dual joint sealant installation to ensure that the interior line of sealant is allowed to adequately cure prior to exterior joint sealant installation.

D. Temporary terminations are required to protect installed sealant and sealant backings from moisture contamination at the end of each work day.

3.4 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed and cured sealant joints as follows:
      a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
      b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
   2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
      a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   3. Inspect tested joints and report on the following:
      a. Whether sealants filled joint cavities and are free of voids.
      b. Whether sealant dimensions and configurations comply with specified requirements.
      c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
   4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
   5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.6 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.7 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 07 95 00 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Interior expansion control systems.
   2. Exterior wall expansion control systems.

1.3 ACTION SUBMITTALS

A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

B. Samples for Initial Selection: For each type of expansion control system indicated.
   1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.

C. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
   1. Manufacturer and model number for each expansion control system.
   2. Expansion control system location cross-referenced to Drawings.
   3. Nominal joint width.
   4. Movement capability.
   5. Classification as thermal or seismic.
   6. Materials, colors, and finishes.
   7. Product options.
   8. Fire-resistance ratings.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
   1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
   2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

B. Coordination: Coordinate installation of exterior wall expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.

2.3 INTERIOR EXPANSION CONTROL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or a comparable product by one of the following:
1. Architectural Art Mfg., Inc.; Division of Pittcon Industries.
2. Balco, Inc.
3. Construction Specialties, Inc.
4. JointMaster/InPro Corporation.
5. MM Systems Corporation.

C. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

D. Basis of Design: Refer to Architect's Master Schedule.

E. Floor-to-Floor :
1. Design Criteria:
a. Nominal Joint Width: As indicated on Drawings.
b. Movement Capability: -25 percent/+75 percent.
c. Load Capacity:
1) Uniform Load: 150 lb/sq. ft..
2) Concentrated Load: 2000 lb.
3) Maximum Deflection: 0.5 inch.
d. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than that of adjacent construction.

F. Wall-to-Wall :
1. Design Criteria:
a. Nominal Joint Width: As indicated on Drawings.
b. Movement Capability: -25 percent/+75 percent.
c. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than that of adjacent construction .

2.4 EXTERIOR WALL EXPANSION CONTROL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Architectural Art Mfg., Inc.; Division of Pittcon Industries.
2. Balco, Inc.
3. Construction Specialties, Inc.
4. EMSEAL Corporation.
5. JointMaster/InPro Corporation.
6. MM Systems Corporation.
7. Tremco Incorporated.
8. Watson Bowman Acme Corp.; a BASF Construction Chemicals business.

B. Basis of Design: Refer to Architect's Master Schedule.

C. Wall-to-Wall :
1. Design Criteria:
a. Nominal Joint Width: As indicated on Drawings.
b. Movement Capability: -25 percent/+75 percent.
c. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than that of adjacent construction.

2.5 MATERIALS

A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.
1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.

D. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.

E. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required fire-resistance rating.

F. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

G. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to expansion control system manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.

B. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
1. Provide in continuous lengths for straight sections.
2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

C. Foam Seals: Install with adhesive recommended by manufacturer.

D. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

E. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion control system materials and associated work so complete assemblies comply with assembly performance requirements.
1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 07 95 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes hollow-metal work.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

B. Standard Hollow Metal Work to comply with the following Steel Door Institute Performance Standards:
1. Hollow metal work fabricated according to ANSI/SDI A250.8 (R2008).
2. ANSI/SDI A250.4 (2001) - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 (R2009) - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 (R2004) - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 (2001) - Recommended Erection Instructions for Steel Frames.
6. ANSI/SDI A250.13 (2008) – Testing and Rating of Severe windstorm Resistant Components for Swinging Door Assemblies.
7. SDI 111 (2008 – Recommendations for Selection and Usage Guide for Standard Steel Doors and Frames.
8. SDI 117 (2009) – Manufacturing Tolerances Standard Steel Doors and Frames.
9. SDI 122 (2007) - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
10. SDI 124 (1998) - Maintenance of Standard Steel Doors and Frames.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:
1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames from single source manufacturer.

B. Preinstallation Conference: Conduct conference at Project site to review anchor methods, electrical conduit connections and custom installation of unusual openings such as pocket frames, single rabbet double egress frames and recessed doors flush with walls.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.
   1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.
   2. Any scratches or disfigurements caused in shipping or handling are promptly cleaned and touched up with a rust-inhibitive primer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 and UL10C, embossed labels are acceptable on standard 3 sided door frames.
   1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
   2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

B. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

C. Smoke-Control Door Assemblies: Comply with NFPA 105.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following SDI members manufacturers:
   1. Ceco Door Products; an Assa Abloy Group company.
   2. Curries Company; an Assa Abloy Group company.
   3. Pearland Industries
   4. Steelcraft; an Allegion Company.
   5. No Substitutions: Only material from an SDI member will be allowed on the Project Site unless prior approval is given in accordance with substitution request requirements per General Requirements.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.3 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.4 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.
1. Physical Performance: Level B according to SDI A250.4.
2. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches.
   c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of inch (16 gage).
   d. Edge Construction: Model 2, Seamless.
   e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
3. Frames:
   a. Materials: Steel sheet, minimum thickness of 0.053 inch.
   b. Construction: Full profile and throat welded.
   c. Frames for Level 2 Steel Doors: (16 gage) - thick steel sheet.
   d. Frames 48-inches and wider in opening width are required to me min. (14 gage) thick steel sheet.
   e. Frames for Wood Doors: (16 gage) 0.053-inch- thick steel sheet.
   f. Frames for Borrowed Lights: (16 gage) 0.053-inch- thick steel sheet.
   g. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.
   h. Knock down frames field welded are not acceptable.
4. Exposed Finish: Factory prime, field painted. Refer to section 09 91 00 - Painting.

2.5 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.
1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches
   c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 gage), with minimum A60 coating.
   d. Edge Construction: Model 2, Seamless.
   e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
      1) Thermal-Rated Doors: Provide doors fabricated with assembly thermal-transmittance value (U-Factor) of not greater than 0.50 Btu/h-sf-F when tested according to ASTM C 1363.
3. Frames:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
   b. Construction: Full profile and throat welded.
   c. Frames for Level 3 Steel Doors: (14 gage) thick steel sheet.
4. Exposed Finish: Factory prime, field painted. Refer to section 09 91 00 – Painting.

2.6 FRAME ANCHORS

A. Jamb Anchors:
1. Masonry Anchors: Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the (T-strap) (or) (stirrup) (or) (wire) type. Anchors shall be not less than 16 gage steel or 0.156" diameter steel wire. Stirrup straps shall be not less than 2" X 10" in size, corrugated and/or perforated. The number of anchors provided on each jamb shall be as follows:
a. Frames up to 60" height 2 anchors.
b. Frames greater than 60" up to 90" 3 anchors.
c. Frames greater than 90" up to 96" 4 anchors.
d. Frames greater than 96" 4 anchors plus one for each 24" or fraction thereof over 96", spaced at 24"maximum between anchors.
2. Stud Anchors: Welded frames for installation in stud partitions shall be provided with steel anchors of suitable design, not less than 18 gage thickness, secured inside each jamb as follows:
a. Frames up to 60" height 2 anchors.
b. Frames greater than 60" up to 90" 4 anchors.
c. Frames greater than 90" up to 96" 5 anchors.
d. Frames greater than 96" 5 anchors plus one for each 24" or fraction thereof over 96" spaced at 24" maximum between anchors.
3. Frames to be anchored to previously placed concrete, masonry or structural steel shall be provided with anchors of suitable design and quantity as shown on approved shop drawings. Fasteners for such anchors shall be provided by others.
4. Slip on frames shall be provided with a single adjustable tension anchor in each jamb and provision for secure attachment of each jamb base to stud runners.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Monolithic Concrete Slabs: Floor anchorsshall be provided with two holes for fasteners and shall be fastened inside jambs with at least four (4) spot welds per anchor
3. Separate Topping Concrete Slabs: Adjustable- floor anchors , providing no less than 2 in. height adjustment, shall be fastened in place with at least four (4) spot welds per anchor. Terminate bottom of frames at finish floor surface.

2.7 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.8 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow-Metal Doors:
1. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
4. Continuous Hinge Reinforcement: Provide continuous 12 gage strap tack welded to door edge for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware," unless door has continuous steel channel for hinge reinforcement.
5. Electrical Raceways: Provide raceways to accommodate up to twelve (12) wires as required for electrified door hardware specified in hardware sets in Division 08 Section "Door Hardware." Provide sufficient number of concealed wires to accommodate electrical function of specified hardware. Wire nut connections are no acceptable.
6. Seamless Edge: Provide seamless edge on hollow metal doors by intermittently tack welding seam, edge filled, grinding smooth and finishing edge free from defects and blemishes.

D. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Equal Rabbet Frames: Provide frames with equal rabbet dimensions unless glazing and removable stops require wider dimension on glass side of frame.
4. High frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 42-inch and wider with mortise/butt type hinges only at top hinge location to deter against hinge reinforcement sag.
5. Continuous Hinge Reinforcement: Provide continuous 12 gage strap tack welded to frame stop for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware."
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
7. Provide A60 Galvannealed coating at frames in restrooms with showers/Jacuzzi, clean areas such as surgery rooms and surgical suites, clean rooms, and soil rooms.
8. Electrical Knock Out Boxes: Factory weld 18 gage electrical knock out boxes to frame for electrical hardware preps; included to electrical thru wire hinges, electrical raceways, door position switches, electric strikes, jamb mount card readers, and magnet locks as noted in door hardware sets in Division 8 Door Hardware and security prints.
    a. Electrical knock out boxes are required at door position switches, electric strikes, card readers, and middle hinge locations for all exterior locations regardless of electrical hardware specified in Division 8 Door Hardware and security prints.
    b. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
    c. Conduit to be factory installed for electric hardware preps. Frames with factory installed conduit to have weld in place anchors.
    d. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 8 Door Hardware and security prints.
    e. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb, coordinate with hardware supplier
    f. Provide conduit for standardized plug connectors to accommodate up to (12) wires for electrified door hardware specified in hardware sets in Division 08 Section "Door Hardware" and security prints.
9. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
10. Jamb Anchors: Provide number and spacing of anchors as follows:
    a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        1) Three anchors per jamb up to 60 inches high.

2) Four anchors per jamb from 60 to 90 inches high.
3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

c. Compression Type: Not less than two anchors in each frame.
d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

11. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware."
a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

G. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
6. Gap for butted or mitered joints in glass stop should not exceed .0625 inch.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.10 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory after installation of frame in wall. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Install frames with removable stops located on secure side of opening.
      d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      f. Field apply bituminous coating to backs of frames that will be filled with grout.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
      a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
   3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
   4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
   5. Field Supplied Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural suppots or substrates above frame unless frame is anchored to masonry otr to other structural support at each jamb. Bend top of struts to provide flush contact for secuting to supporting construation. Provide adjustable wedged or bolted anchorage to frame jamb members.
   6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
   7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
   8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
      a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
      b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
      c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
      d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Steel Doors:
      a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
      c. At Bottom of Door: 3/8 inch plus or minus 1/32 inch.
      d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
   3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.
   1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.
   2. Secure exterior removable stops with security head screws.

E. Threshold:
   1. Set threshold in a full bed of sealant.
   2. All door anchoring at the sill shall have fastener holes injected with sealant prior to permanent fastener installation.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Solid-core doors with plastic-laminate faces.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
   1. Dimensions and locations of mortises and holes for hardware.
   2. Dimensions and locations of cutouts.
   3. Fire-protection ratings for fire-rated doors.

C. Samples for Verification:
   1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
   2. Plastic laminate, 6 inches (150 mm) square, for each color, texture, and pattern selected.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
      b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
   2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
   3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Forte Opening Solutions.
2. Oshkosh Door Company.
3. VT Industries, Inc.

B. Source Limitations: Obtain flush wood doors and wood paneling from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
1. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
4. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
5. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
6. Pairs: Provide formed-steel edges and astragals with intumescent seals.
   a. Finish steel edges and astragals with baked enamel.
   b. Finish steel edges and astragals to match door hardware (locksets or exit devices).

D. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

E. Particleboard-Core Doors:
1. Particleboard: Straw-based particleboard complying with ANSI A208.1, Grade LD-2 or M-2, except for density.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

F. Structural-Composite-Lumber-Core Doors:
1. Structural Composite Lumber: WDMA I.S.10.
   a. Screw Withdrawal, Face: 700 lbf.
   b. Screw Withdrawal, Edge: 400 lbf.

G. Mineral-Core Doors:
1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
   a. 5-inch top-rail blocking.
   b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
   c. 5-inch midrail blocking, in doors indicated to have armor plates.
   d. 4-1/2-by-10-inch lock blocks, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 PLASTIC-LAMINATE-FACED DOORS

A. Interior Solid-Core Doors:
1. Grade: Custom.
2. Plastic-Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HGS.
3. Colors, Patterns, and Finishes: Refer to Architect's Master Schedule.
4. Exposed Vertical Edges: Plastic laminate that matches faces, applied before faces.
5. Top and Bottom Edges: Hardwood edges for painting.
6. Core: Particleboard or Structural composite lumber.
7. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before faces and crossbands are applied.
8. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES AND LOUVERS

A. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Factory cut and trim openings through doors.
1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted ontop and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors where indicated in schedules or on Drawings as factory finished.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.
1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
   1. Install fire-rated doors according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Access doors and frames for walls and ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings:
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
   2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Acudor Products, Inc.
   2. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
   3. Nystrom, Inc.

C. Basis of Design: Refer to Architect’s Master Schedule.

2.3 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, [Type 304] [Type 316]. Remove tool and die marks and stretch lines or blend into finish.

D. Frame Anchors: Same type as door face.

E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
   1. For concealed flanges with drywall bead, provide edge trim for gypsum board and gypsum base securely attached to perimeter of frames.
   2. Provide mounting holes in frames for attachment of units to metal or wood framing.
   3. Provide mounting holes in frame for attachment of masonry anchors.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:
   1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

E. Stainless-Steel Finishes:
   1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

SECTION 08 33 23 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Insulated service doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.
   1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
   5. Show locations of controls, locking devices, and other accessories.
   6. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
   1. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
   1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and Texas Accessibility Standards (TAS).

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
1. Obtain operators and controls from overhead coiling door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
1. Design Wind Loads: As indicated on structural drawings or as otherwise determined using design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) (10 m) , according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure.".
2. Testing: According to ASTM E 330.
3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
4. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.

2.3 DOOR ASSEMBLY

A. Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Clopay.
b. Cookson Company.
c. Overhead Door Corporation.
2. Basis of Design: Cookson Company; Model ESD30.

B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
1. Include tamperproof cycle counter.

C. Curtain R-Value: 8.0 deg F x h x sq. ft./Btu.

D. Door Curtain Material: Galvanized steel.

E. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height.
1. Insulated-Slat Interior Facing: Metal.
2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

F. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from hot-dip galvanized steel and finished to match door.

G. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

H. Hood: Match curtain material and finish.
1. Shape: As shown on Drawings.
2. Mounting: As shown on Drawings.

I. Locking Devices: Equip door with locking device assembly.
1. Locking Device Assembly: Cremone type, both jamb sides locking bars, operable from inside and outside with cylinders.

J. Electric Door Operator:
1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Operator Location: As shown on Drawings.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use.
4. Motor Exposure: Interior.
5. Emergency Manual Operation: Push-up type.
6. Obstruction-Detection Device: Automatic photoelectric sensor; self-monitoring type.
7. Control Station(s): Where shown on Drawings.

K. Curtain Accessories: Equip door with push/pull handles.

L. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.
3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch and minimum aluminum thickness of 0.032 inch.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.6 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.

2.7 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
1. Lock Cylinders: Cylinders standard with manufacturer and keyed to building keying system.
2. Keys: Two for each cylinder.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.

B. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
1. At door head, use 1/8-inch- thick, replaceable, continuous-sheet baffle secured to inside of hood or field- installed on the header.
2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene.

C. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

D. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

2.9 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic closing device operates.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Chamberlain Group, Inc. (The).
2. Comply with NFPA 70.
3. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Door Operator Location(s): Operator location indicated for each door.

C. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
1. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

D. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

E. Obstruction Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel. For fire-rated doors, activation delays closing.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.

F. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

G. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

H. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Perform installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
   3. Test door closing when activated by detector or alarm-connected fire-release system. Reset door-closing mechanism after successful test.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
   1. Adjust exterior doors and components to be weather-resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   1. Perform maintenance, including emergency callback service, during normal working hours.
   2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 08 33 23

SECTION 08 34 73 – SOUND CONTROL DOOR ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Wood sound control door assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include sound ratings, construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: For sound control door assemblies.
1. Include elevations of each door design.
2. Include details of sound control seals, door bottoms, and thresholds.
3. Include details of doors, including vertical- and horizontal-edge details and metal thicknesses.
4. Include frame details for each frame type, including dimensioned profiles and metal thicknesses.
5. Include locations of reinforcements and preparations for hardware.
6. Include details of each different wall opening condition.
7. Include details of anchorages, joints, field splices, and connections.
8. Include details of accessories.
9. Include details of moldings, removable stops, and glazing.
10. Include details of conduits and preparations for power, signal, and control systems.

C. Samples for Verification: For each type of exposed finish not less than 3 by 5 inches.
1. Doors and Frames: Samples approximately 12 by 12 inches.
a. Doors: Include section of vertical-edge, top, and bottom construction; automatic door bottom or gasket; core construction; and hinge and other applied hardware reinforcement.
b. Frames: Include profile, corner joint, floor and wall anchors, and seals.

D. Schedule: Provide a schedule of sound control door assemblies prepared using same reference numbers for details and openings as those on Drawings. Coordinate with the Door Hardware Schedule.

1.3 QUALITY ASSURANCE

A. Guarantee all material furnished and installed under this section to be free from defects in material and workmanship for a period of one year from substantial completion of the project.

B. All work of this section shall be furnished by a single manufacturer experienced in the manufacture of sound rated door and frame assemblies for at least five years.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Avoid the use of nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.

B. Store doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install wood sound control doors until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sound control door assemblies that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure to meet sound rating requirements.
      b. Faulty operation of sound seals.
      c. Deterioration of metal frames, metal finishes, and other materials beyond normal use or weathering.
      d. Wood doors that are warped (bow, cup, or twist) more than 1/4 inch (6 mm) in a 42-by-84-inch (1067-by-2134-mm) section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span.
      e. Verify available warranties and warranty periods for units and components.
   2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sound Rating: Provide sound control door assemblies identical to those of assemblies tested as sound-retardant units by an acoustical testing agency, and have the following minimum rating:
   1. STC Rating: As indicated in the Door Schedule as calculated by ASTM E413 when tested in an operable condition according to ASTM E90.

2.2 MANUFACTURERS

A. Subject to compliance with these specifications, the following firms are approved manufacturers of sound rated door and frame assemblies:
   1. Krieger Specialty Products.
   2. Overly Door Company.
   3. Protective Door Industries.
   4. Wenger Corporation.

B. Basis of Design: Krieger Specialty Products.

C. Source Limitations: Obtain steel sound control door assemblies, including doors, frames, sound control seals, hinges, thresholds, and other items essential for sound control, from single source from single manufacturer.

2.3 WOOD SOUND CONTROL DOORS

A. Doors: Flush-design sound control doors, thickness as required to provide STC rating; with manufacturer's standard sound-retardant core as required to provide STC rating indicated. Fabricate in accordance with WDMA 1.S.1-A.

B. Materials: Wood-Veneer Faced Doors:
   1. Grade: Premium (Grade A faces).
   2. Species: Refer to Architect’s Master Schedule.
   3. Cut: Refer to Architect’s Master Schedule.
   4. Match between Veneer Leaves: Refer to Architect’s Master Schedule.
   5. Assembly of Veneer Leaves on Door Faces: Refer to Architect’s Master Schedule.
   6. Vertical and Top Edges: Same species as faces or a compatible species - edge Type A.
   7. Core: Particleboard.
   8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

2.4 SOUND CONTROL FRAMES

A. Frames: Fabricate sound control door frames with corners mitered, reinforced, and continuously welded the full depth and width of frame. Fabricate in accordance with NAAMM-HMMA 865.
   1. Weld frames in accordance with NAAMM-HMMA 820.
   2. Interior Frames: Fabricate from cold-rolled steel sheet unless otherwise indicated, 0.075-inch nominal thickness or thicker as required to provide STC rating indicated.

3. Hardware Reinforcement: Fabricate in accordance with NAAMM-HMMA 865 of same material as face sheets.
4. Head Reinforcement: Metallic-coated steel channel or angle stiffener, 0.108-inch nominal thickness.
5. Jamb Anchors:
   a. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.064-inch nominal-thickness metallic-coated steel with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.156 inch thick.
   b. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.048-inch nominal-thickness uncoated steel unless otherwise indicated.
   c. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter, metallic-coated steel bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
6. Floor Anchors: Not less than 0.079-inch nominal-thickness metallic-coated steel, and as follows:
   a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
   b. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.
7. Ceiling Struts: Minimum 3/8-inch-thick by 2-inch- wide uncoated steel unless otherwise indicated.

B. Materials:
1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
3. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B, with G60 zinc (galvanized) or A40 zinc-iron-alloy (galvannealed) coating designation.
4. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls in accordance with ASTM A153/A153M, Class B.
5. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized in accordance with ASTM A153/A153M or ASTM F2329.
6. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching sound control door frames of type indicated.
7. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

C. Finishes:
1. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
   a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.1 DOOR HARDWARE

A. Hardware preparation:
1. Mortise, reinforce, drill, and tap frames at factory for fully templated mortised hardware only, in accordance with approved hardware schedule and supplied templates.
2. Provide reinforcing plates at surface-mounted or non-templated hardware locations.
3. Provide suitable anchors to properly install frames in partition types as shown on architect’s drawings.

B. Door Hardware:
1. Hinges shall be cam-lift type provided in conjunction with fixed door bottom seals. Surface strap or butt hinges, as well as automatic door bottoms, are not acceptable.
2. Hinge, lock, and head of the door shall close against positive neoprene compression and / or magnetic seals mounted in the door frame and / or leaf, as required to meet specified acoustical performance. Combination felt/neoprene seals are not acceptable.
3. Furnish a smooth flush steel threshold; raised sills are not acceptable.
4. Where a double leaf door is specified, an astragal seal shall be provided for the full height of the door, as required to meet the specified acoustical performance.
5. All other hardware shall be as specified elsewhere in Division 08 and supplied / installed by others.

2.2 FABRICATION

A. Wood Sound Control Door Fabrication: Factory fit doors to suit frame-opening sizes indicated, with uniform clearances and bevels in accordance with WDMA I.S.1-A unless otherwise indicated. Comply with final door hardware schedules and hardware templates.

B. Sound Control Frame Fabrication: Fabricate sound control frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of sound control door frame connections before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace sound control door frames to the following tolerances:
1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION, GENERAL

A. Door and frame assemblies shall be installed in accordance with approved shop drawings, manufacturer’s installation instructions, and these specifications.

B. Doors shall be installed by manufacturer’s trained and authorized installer or contractor trained and approved by the manufacturer.

C. The manufacturer shall provide factory trained supervisory personnel at the site during the initial frame installation, during initial door installation, and at final inspection. The manufacturer shall issue a letter of compliance certifying the completion of the installation in accordance with these specifications.

D. Hang doors and adjust for free swinging operation without binding, sticking, sagging or excessive clearances.

E. All frames shall be packed tightly with loose, lightweight fiberglass during installation.

F. Caulk joint between frame trim and partition prior to painting.

G. Install sound control door assemblies during finish phase of construction to protect units from damage.

3.4 ADJUST AND CLEAN

A. Final Adjustments: Check and adjust seals, door bottoms, and other sound control hardware items right before final inspection. Leave work in complete and proper operating condition.

B. Remove and replace defective work, including defective or damaged sound seals and doors and frames that are warped, bowed, or otherwise unacceptable.
   1. Adjust gaskets, gasket retainers, and retainer covers to provide contact required to achieve STC rating.

END OF SECTION

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Work required under this section is the complete design, fabrication, and installation of a new standard stick built storefront framing system, that shall be conventionally glazed, captured on all four sides, and erected on site.

B. Section Includes:
1. Exterior storefront framing
2. Exterior manual-swing entrance doors

C. This is a Design/Build performance specification where Contractor assumes complete responsibility for the design, installation, and performance, of the completed exterior wall installation in meeting the performance standards identified herein and the Architect's aesthetic requirements as reflected in the Drawings. The Contractor also is responsible for ensuring that the design of its specific anchorage system for the Glazed Aluminum Storefront System will attach to the building's structural framing system without the anchorage system intruding into interior finished area. The Building Structural Engineer has designed the building structural system to accommodate the loads (dead and live loads) imposed upon it by the Glazed Aluminum Storefront System. Modifications (if any) to the building's structural system, as designed by the Building Structural Engineer, that are required to accommodate anchor locations particular to the Glazed Aluminum Storefront System's specific anchorage design are to be included in the Work for the Glazed Aluminum Storefront System.
1. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.
2. Requirements shown by details are intended to establish basic dimension of unit, sight lines and profiles of members.
3. Provide Storefront and door systems including their components, engineered by registered professional engineers, licensed to practice structural engineering in jurisdiction where Project is located. Coordinate work to provide continuous, exterior skin assembly, complying with specified performance requirements for air and water infiltration, including at intersections and transitions between adjacent systems.
4. Provide concealed fastening for the storefront wall systems wherever possible.
5. Coordinate shop drawings and installation of storefront and door systems to resolve conflicts.
6. Allow for installation tolerances, thermal expansion and contraction of adjacent materials, and sealant manufacturer's recommended joint design.
7. Storefront and door systems shall be free from rattles, wind whistles, and noise due to thermal and structural movement and wind pressure.
8. Attachment considerations shall take into account site peculiarities and expansion and contraction movements to eliminate loosening, weakening, or fracturing of connections between units and building structure or between units themselves.
9. Exclude glass, sealants, and interior finishes when determining framing member strength, stiffness, and lateral stability.
10. Storefront systems shall drain to exterior face of wall at the specified performance pressures; water entering system and condensation occurring within system shall be conveyed to the exterior by drain holes and gutters of adequate size to evacuate water without infiltration to interior.
11. Provide components exposed to view of uniform color and profile appearance.

1.3 DEFINNITIONS

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, Installer, manufacturer's representative, and installers whose work interfaces with storefront entrances or storefronts.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.
   3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Manufacturer’s Installation Instructions

1.6 INFORMATIONAL SUBMITTALS

A. Preconstruction Laboratory Mockup Testing Submittals:
   1. Testing Program: Developed specifically for Project.
   2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
   3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.

B. Qualification Data: For Installer.

C. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
   1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

D. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.

E. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.9 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical wall area as shown on Drawings or, if not shown on Drawings, as directed by Architect.
   2. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Noise or vibration created by wind and thermal and structural movements.
      c. Deterioration of metals**,** metal finishes, and other materials beyond normal weathering.
      d. Water penetration through fixed glazing and framing areas.
      e. Failure of operating components.
   2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
   1. Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
      c. Cracking, peeling, or chipping.
   2. Warranty Period: 10 years from date of Substantial Completion.

C. Special Installer Warranty: Submit Installer's warranty.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with requirements specified herein as determined by testing of glazed aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Aluminum-framed entrances and glazed aluminum storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
   2. Failure also includes the following:
      a. Thermal stresses transferring to building structure.
      b. Glass breakage.
      c. Noise or vibration created by wind and thermal and structural movements.
      d. Loosening or weakening of fasteners, attachments, and other components.
      e. Failure of operating units.
      f. Sealant failure.
      g. Damage to or failure of glazing, framing members, and/or structural connections.
      h. Deflection exceeding specified limits.

B. Delegated Design: Design glazed storefronts, including comprehensive engineering analysis by a qualified professional engineer, registered in the State of Texas, using performance requirements and design criteria indicated.

C. Structural Requirements: Provide storefront systems and components engineered by registered professional engineer licensed to practice structural engineering in jurisdiction where Project is located in accordance with the requirements listed below.

D. Structural Loads:
1. Wind Loads: As indicated on Structural Drawings.

E. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.
3. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175:
4. Main framing members shall have no permanent deformation in excess of 0.1 percent of their clear span
5. Member support points limited to 1/16” maximum deflection under the most critical loading conditions

F. Structural Test Performance: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than **10** seconds.

G. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
2. Entrance Doors:
a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
b. Single Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.

H. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 8 lbf/sq. ft.

I. Provision for Movement: Provide for expansion and contraction due to structural deflection, structural movement, and temperature changes. In addition, design the storefront system to meet the requirements provided below without detriment to appearance or performance

J. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Test Interior Ambient-Ait Temperature: 75 deg F.
3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

K. Energy Performance: Glazed aluminum curtain walls shall have certified and labeled energy performance ratings in accordance with NFRC.
1. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) per AAMA 507 or NFRC 100, shall not be more than:
a. As indicated on ‘Energy Code Information’ on Architectural Drawings.
2. Condensation Resistance (CR): Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 63 as determined according to NFRC 500.

2.2 EXTERIOR STOREFRONT FRAMING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. EFCO Corporation.
2. Kawneer North America; an Alcoa Company.
3. Oldcastle BuildingEnvelope.
4. YKK AP America Inc.
5. Tubelite, Inc.

B. Basis of Design:
1. Kawneer, Trifab 451T.

C. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

D. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken
2. Glazing System: Retained mechanically with gaskets on four sides, or as indicated on drawings.
3. Glazing: 1 inch insulated glass, or as indicated on door schedule and Master Schedule.
4. Glazing Plane: Front
5. Finish: Clear anodized.
6. Fabrication Method: Screw Spline
7. No exposed fasteners
8. Open back head and jamb members to have continuous fillers.

E. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

F. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

G. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
d. Structural Profiles: ASTM B 308/B 308M.
2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 EXTERIOR ENTRANCE DOOR SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. EFCO Corporation.
2. Kawneer North America; an Alcoa Company.
3. Oldcastle BuildingEnvelope.
4. YKK AP America Inc.
5. Tubelite, Inc.

B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
1. Standard Entrances:
a. Wide Stile: Kawneer 500 (1 ¾ in. x 5 in)

C. Door Construction: Extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

D. Bottom Rail: ADA Compliant

E. Glazing: 1 inch clear tempered insulated glass, or as indicated on door schedule and Master Schedule.

F. Glazing Stops and Gaskets: Beveled , snap-on, extruded-aluminum stops and preformed gaskets.

1. Provide non-removable glazing stops on outside of door.

G. Finish: Clear anodized.

2.4 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware."

B. General: Provide entrance door hardware and entrance door hardware sets indicated in "Entrance Door Hardware Sets" Article for each entrance door to comply with requirements in this Section.
1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
3. Opening-Force Requirements:
a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
b. Accessible Interior Doors: Not more than 5 lbf to fully open door.

C. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:
1. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

D. Thresholds: BHMA A156.21, raised thresholds beveled with bubble gasketed and a slope of not more than 1:2, with maximum height of 1/2 inch.
1. Back dam or raised edge design to prevent water infiltration.
2. Fully seat threshold in sealant during installation.
3. All door anchoring at the sill shall have fastener holes injected with sealant prior to permanent fastener installation.

2.5 GLAZING

A. Glazing: Comply with Section 08 80 00 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer

D. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
1. Color: Match structural sealant.

2.6 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

B. Anchors: Three-way adjustable anchors with minimum adjustment of **1 inch** that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

C. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using screw-spline system

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:
1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.

5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.
7. All materials to be installed by experienced craftsmen in accordance with manufacturer's written specifications.
8. After installation, the Contractor shall protect all exposed aluminum surfaces from damage by grinding and polishing compounds, plaster, lime, acid, cement, or other contaminants. The Contractor shall be responsible for final cleaning

B. Metal Protection:
1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 08 80 00 "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts .
1. Water Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
a. Test Area: One bay wide or as directed by the Architect.
b. Perform a minimum of five tests in areas as directed by Architect at 10%, 25%, 50%, 75% and 100% completion.
2. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft., of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure differential of 12 lbf/sq. ft.
a. Test Area: One bay wide or as directed by the Architect.
b. Perform a minimum of five tests in areas as directed by Architect at 10%, 25%, 50%, 75% and 100% completion.

3. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 12 lbf/sq. ft., and shall not evidence water penetration. Test shall encompass window perimeter.
   a. Test Area: One bay wide or as directed by the Architect.
   b. Perform a minimum of five tests in areas as directed by Architect at 10%, 25%, 50%, 75% and 100% completion.
4. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
1. Water penetration shall be defined as any uncontrolled water, other than condensation, that appears on any interior surface of the glazed aluminum curtain wall, or on any surface inside the concealed spaces of the glazed aluminum curtain wall or adjacent construction not designed specifically to function as part of the rainwater management system for the building enclosure. This definition of water penetration governs over those found in referenced documents and industry standards.
2. For each failure condition discovered, make corrective repairs approved by the Architect and retest until the leakage is eliminated. All failures shall be considered systemic failures requiring corrective work at all similar conditions. Remedial measures shall maintain standards of aesthetics, quality, and durability, and are subject to approval by the Architect.
3. For each failed test, test an additional location until successful results are achieved.
4. Additional testing and inspecting will be performed at Contractor’s expense to determine the compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.6 MAINTENANCE SERVICE

A. Entrance Door Hardware:
1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

3.7 ENTRANCE DOOR HARDWARE SETS

A. Refer to Section 08 71 00 “Door Hardware”

END OF SECTION 08 41 13

SECTION 08 71 00 - DOOR HARDWARE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Hardware for hollow steel and plastic laminate doors.
B. Thresholds.
C. Weather-stripping, seals and door gaskets.

1.2 REFERENCES

A. ADA – Americans with Disabilities Act, Accessibility Guidelines.
B. ANSI A117.1 – Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
C. NFPA 80 – Fire Doors and Windows.
D. AWI – Architectural Woodwork Institute – Quality Standards.
E. NFPA 101 – Code for Safety to Life from Fire in Buildings and Structures.
F. NFPA 252 – Fire Tests of Door Assemblies.
G. TAS – Texas Accessibility Standards.
H. UL 10B – Fire Tests of Door Assemblies.
I. UL 305 – Panic Hardware

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Shop Drawings: Indicate locations and mounting heights of each type of hardware.
C. Submit manufacturer’s parts lists and templates.
D. Manufacturers Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
E. All templates will be included with submittal documents to be turned over to door supplier.

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01 70 00.
B. Record actual locations of installed cylinders and their master key code.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01 70 00.
B. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with the following requirements:

1. ADA.
2. ANSI A117.1.
3. NFPA 101.
4. NFPA 80.
5. NFPA 252.
6. TAS.

1.7 QUALIFICATIONS

A. Hardware Supplier Company specializing in supplying commercial door hardware with five years documented experience.
B. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for requirements applicable to fire rated doors and frames.
B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.
B. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.
C. Deliver keys to Owner by security shipment direct from hardware supplier.

1.10 COORDINATION

A. Coordinate work under provisions of Section 01 03 90.
B. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

1.11 WARRANTY

A. Provide five year warranty under provisions of Section 01 70 00.
B. Warranty: Include coverage for door closers.

1.12 MAINTENANCE MATERIALS

A. Provide maintenance materials under provisions of Section 01 70 00.
B. Provide special wrenches and tools applicable to each different or special hardware component.
C. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 – PRODUCTS

2.1 HINGING METHODS:

A. Note: drawings typically depict doors at 90 degrees doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.

B. Hinges: Steel or stainless steel pins and concealed bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.

1. Three hinges per leaf to 7 foot, 6 inch height. Add one for each additional 30 inches in height, or any fraction thereof.
2. Extra heavy weight hinges on doors over 3 feet, 5 inches in width.
3. Extra-heavy weight hinges on doors with panic hardware or fire exit devices.
4. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins.
5. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.
6. Provide shims and shimming instructions for proper door adjustment.
7. All hinges to be ball bearing type on high use or doors with closers. Plain Bearing hinges are acceptable for any door that is not high traffic without a closer.
8. Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.

Acceptable Manufacturers: Ives, PBB, Hager

C. Continuous Hinges:

1. Pin and barrel stainless steel at all Exterior high traffic (HM) doors 700 Series.
2. Geared-type aluminum at all Exterior high traffic (Aluminum) doors 112XY series.
3. Geared-type aluminum at all Interior high traffic doors 112XY series.

Acceptable Manufacturers: Ives, Markar, Pemko

2.2 LOCKSETS, LATCHSETS, DEADBOLTS:

A. Extra Heavy Duty Mortise Locks and Latches:

1. Chassis: cold-rolled steel. All functions must be available in one body. Case must be multi-function, minimum 10 functions in one case, able to be opened and worked on without voiding the warranty. Functions will be changed by changing the cam on the back of the cylinder. Latch must be all steel. Pot metal on the latch will not be accepted.
2. Latchbolts: 3/4 inch throw, 2 piece stainless steel anti-friction type.
3. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
   a. Spindles: security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
4. Thumbturns: accessible design not requiring pinching or twisting motions to operate.
5. Deadbolts: stainless steel 1-inch throw.
6. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.

   a. ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
   b. ANSI/ASTM F476-84 Grade 31 UL Listed.

B. On renovations smaller than 20 doors, consult district lock shop

BASIS OF DESIGN: SCHLAGE L9000 17A SERIES (NO SUBSTITUTION)

2.3 KEYING REQUIREMENTS:

Key System: All cylinders will be keyed into the district's patented restricted existing small format interchangeable core key system. Cylinders must be compatible across small format interchangeable core and conventional format cylinders keyed to existing district A2 system. A vertical traveling pin will be used for a patent and placement shall be near the front of the cylinder for easy drilling of damaged cores. A restricted order verification system must currently in place to verify orders. A minimum of 5 keyways must be available in the system. Cores must be warrantied in any manufacturer's hardware. All keyways in the family must be able to be operated by one key. System must be patented until 2029. Key system must be UL437 capable. A preliminary key meeting will be held to establish guidelines for the system and a secondary key meeting will be held to review the proposed key system. Permanent cores shall be Contractor Furnished to be shipped directly to the district lock shop for owner installation. A construction key system will be in place during the construction period. Three control keys for the construction key system will be turned over to the district for installation of the permanent cores. Provided CKC Key Control all cores. Furnish (5) GMKS, (5) MKYS per set, (2) Change Keys per core. Bitting list must be provided in Excel spreadsheet format from the manufacturer to be directly input by file transfer into Sitemaster.

BASIS OF DESIGN: SCHLAGE EVEREST 29R (NO SUBSTITUTION)

2.4 EXIT DEVICES / PANIC HARDWARE

A. General features:
1. Independent lab-tested 1,000,000 cycles**.** Must meet ANSI-156.3 – 2014.
2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated.
3. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function. Center case must be constructed of pressed steel, CAST STEEL ZINC DICHROMATED WILL NOT BE ACCEPTED. Four screws minimum will be required to fasten the center case.
4. Releasable in normal operation with 15-lb. maximum operating force, and with 32 lb. maximum pressure under 250-lb. load to the door.
5. Extruded aluminum grooved body.
6. Both solenoid and motorized electronic latch retraction must be available.

B. Specific features:

1. Supply rim devices with key removable mullion at all openings. *(Surface/Concealed vertical rods WILL NOT be accepted).*
2. Non-Fire Rated Devices: cylinder dogging.
3. Exit Device Trim: Stainless steel (Exterior/Interior) **vandal resistant trim** thru-bolted to device with plastisol coated grip. Night latch function retracts latch with use of key.
4. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware".
5. Delayed Egress Devices: Function achieved within single exit device component, including latch, delayed locking device, request-to-exit switch, nuisance alarm, remote alarm, key switch, indicator lamp, relay, internal horn, door position input, external inhibit input plus fire alarm input. NFPA 101 "Special Locking Arrangement" compliant.
6. Electrically Operated Devices: Single manufacturer source for electric latch retraction devices, electrically controlled trim, power transfers, power supplies, monitoring switches and controls.
7. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.

BASIS OF DESIGN: VON DUPRIN 99 (NO SUBSTITUTION)

2.5 CLOSERS

B. Surface Closers:

1. Full rack-and-pinion type cylinder with molded plastic cover and cast iron body. Pinion must be ¾". Bearings must be full compliment. Arms must be forged steel. Minimum .625" bearing height required. Body must be powder coated, not spray lacquer. Size adjustment must be verified by visual aid on the end of the cylinder with a numeric dial. Snap on covers are to be standard.
2. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
3. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
4. Opening pressure: Exterior doors 8.5 lb., interior doors 5 lb., labeled fire doors 15 lb.
5. Separate adjusting valves for closing speed, latching speed and backcheck
6. Parallel Rigid arms (PR) at exterior doors scheduled with parallel arm units.
7. Exterior doors do not require seasonal adjustments in temperatures from 120 degrees F to –30 degrees F, furnish data on request.
8. Pressure Relief Valves (PRV): unsafe, not permitted.
9. Permanent metal templates must be available for installation.

BASIS OF DESIGN: LCN 4040XP SERIES (NO SUBSTITUTION)

2.6 OTHER HARDWARE

A. Automatic Flush Bolts: Low operating force design, "LBR" type where scheduled.

B. Surface Bolts: Shall be used at pairs of doors from non-fire rated Mechanical rooms for the inactive leaf.

C. Overhead Stops: Stainless steel (100 series). Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

D. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

E. Door Stops: Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide wall type Ives WS406/WS407 series with appropriate fasteners (AND WOOD BLOCKING) provided. Where wall type cannot be used, provide floor type. (Ives FS18S exterior and FS436 Interior) If neither can be used, provide overhead type.
2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum: 90deg stop / 95deg deadstop. Note degree of opening in submittal.

F. Seals: Finished to match adjacent frame color. Resilient seal material: polypropylene, nylon brush, or solid high-grade neoprene. UL label applied to seals on rated doors. Substitute products: certify that the products equal or exceed specified material's thickness and durability. Proposed substitutions: submit for approval.

1. Solid neoprene: MIL Spec. R6855-CL III, Grade 40.
2. Non-corroding fasteners at in-swinging exterior doors.
3. Exterior pairs of mechanical room doors: Doors shall be equipped with appropriate seals, astragal, threshold, drip cap and sweeps to prevent the intrusion of rain water. Provide astragals at all interior pairs of doors to mechanical rooms.
4. Sound control openings: Use components tested as a system using nationally accepted standards by independent laboratories. Ensure that the door leafs have the necessary sealed-in-place STC ratings. Adhesive mounted components not acceptable. Fasten applied seals over bead of sealant.

5. Fire-rated Doors, Resilient Seals: UL10C / UBC Standard 7-2 compliant. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements. Where rigid housed resilient seals are scheduled in this section and the selected door manufacturer only requires an adhesive-mounted resilient seal, furnish rigid housed seal at minimum, or both the rigid housed seal plus the adhesive applied seal. Adhesive applied seals alone are deemed insufficient for this project where rigid housed seals are scheduled.
6. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C / UBC Standard 7-2. Where required, Intumescent seals vary in requirement by door type and door manufacture -- careful coordination required. Adhesive-applied Intumescent strips are not acceptable, use concealed-in-door-edge type or kerfed-in-frame type.
7. All exposed exterior doors not under a cover are to have a rain drip to extend four inches outside the width of the door.

G. Automatic door bottoms: low operating force units. Doors with automatic door bottoms plus head and jamb seals cannot require more than two pounds operating force to open when closer is disconnected.

H. Thresholds: As scheduled and per details. Substitute products: certify that the products equal or exceed specified material’s thickness. Proposed substitutions: submit for approval.

1. Exteriors: Seal perimeter to exclude water and vermin. Use butyl-rubber or polyisobutylene sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Non-ferrous 1/4inch fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).
2. Acoustic openings: Set units in full bed of Division-7-compliant butyl-rubber or polyisobutylene sealant, leave no air space between threshold and substrate.
3. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.

I. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.

J. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes.

K. Wall- & Floor-mounted electromagnetic door holders: LCN's SEM series or approved equivalent. Incorporate into U.L.-listed fire & life-safety system, doors release to allow closure and latching when door's zone is in alarm state. Use minimum projection required to allow door to open as widely as allowed by wall conditions and projection of door hardware.

BASIS OF DESIGN: IVES, SUBSTITUTIONS INCLUDE BUT ARE NOT LIMITED TO TRIMCO, HAGER, ROCKWOOD, AND OTHER PRODUCTS MEETING THIS STANDARD.

2.7 FINISH:

A. Generally BHMA 626 Satin Chromium
1. Areas using BHMA 626 to have push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.

B. Door closers: factory powder coated to match other hardware, unless otherwise noted.

C. Aluminum items: match predominant adjacent material. Seals to coordinate with frame color.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify site conditions.

B. Verify that doors and frames are ready to receive work and dimensions are as instructed by the manufacturer.

C. Verify that electric power is available to power operated devices and of the correct characteristics.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions.

B. Use templates and fasteners provided by hardware item manufacturer.

C. Use sex bolts to attach panic devices to wood doors and all closers.

D. Hardware installer shall be an entity that specializes in hardware installation and must have a minimum of ten years experience and provide five reference jobs of similar scope. Submit references with hardware submittals/shop drawings.

E. Hardware installer is required to send all personnel that will install on this job shall attend a pre-installation meeting with the manufacturer's representative to review the install instructions.

F. Contractor will install permanent cores and turn all keys over to the district.

3.3 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.4 ADJUSTING

A. Adjust work under provisions of Section 01700.

B. Adjust hardware for smooth operation.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Do not permit adjacent work to damage hardware or finish.

3.6 HARDWARE SETS

132482 OPT0423102 Version 3
Hardware Group No. 001 - OH DOOR

PROVIDE EACH RU DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R QTY REQD	626	SCH
1	EA	SFIC MORT CYLINDER	80-132 W/KEYED CONST. CORE QTY/TYPE REQD	626	SCH
	EA	NOTE	REMAINDER OF HARDWARE BY DOOR MFR.		

-COORDINATE HARDWARE WITH DOOR MFR.

Hardware Group No. 003 - ROOF HATCH

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA	ALL HW BY OTHERS			B/O
	EA	DOOR CONTACT	BY SECURITY CONTRACTOR		B/O

Hardware Group No. 201C - SGL STORAGE CLOSER

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 QTY/SIZE REQD	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBSRT	689	LCN
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 203 - SGL STORAGE

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 203G - SGL STORAGE

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 QTY/SIZE REQD	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
1	EA	HEADER SEAL	429AA-1PC-HEADER WIDTH	AA	ZER
1	EA	JAMB SEAL	870AA-S (2PCS JAMB HEIGHT)	AA	ZER
1	EA	DOOR BOTTOM	369AA/3551AA-Z49 (WD/MD AS REQ)	AA	ZER

Hardware Group No. 203GT - SGL STORAGE

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 5 X 4.5 QTY/SIZE REQD	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
1	EA	HEADER SEAL	429AA-1PC-HEADER WIDTH	AA	ZER
1	EA	JAMB SEAL	870AA-S (2PCS JAMB HEIGHT)	AA	ZER
1	EA	DOOR BOTTOM	369AA/3551AA-Z49 (WD/MD AS REQ)	AA	ZER

Hardware Group No. 203GW - SGL STORAGE

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5 QTY/SIZE REQD	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
1	EA	HEADER SEAL	429AA-1PC-HEADER WIDTH	AA	ZER
1	EA	JAMB SEAL	870AA-S (2PCS JAMB HEIGHT)	AA	ZER
1	EA	DOOR BOTTOM	369AA/3551AA-Z49 (WD/MD AS REQ)	AA	ZER

Hardware Group No. 203S - SGL STORAGE OH STOP

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 QTY/SIZE REQD	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	OH STOP	900S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 203SGW - SGL STORAGE OH STOP

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 QTY/SIZE REQD	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	OH STOP	900S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	HEADER SEAL	429AA-1PC-HEADER WIDTH	AA	ZER
1	EA	JAMB SEAL	870AA-S (2PCS JAMB HEIGHT)	AA	ZER
1	EA	DOOR BOTTOM	369AA/3551AA-Z49 (WD/MD AS REQ)	AA	ZER

Hardware Group No. 203TW - SGL STORAGE

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 5 X 4.5 QTY/SIZE REQD	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 203W - SGL STORAGE

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 5 X 4.5 QTY/SIZE REQD	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 212S - PAIR STORAGE OH STOP

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5 NRP QTY/SIZE REQD	652	IVE
2	EA	SURFACE BOLT	SB360 12" T	604	IVE
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
2	EA	OH STOP	900S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	OVERLAPPING ASTRAGAL	383AA-DOOR HEIGHT	AA	ZER

Hardware Group No. 212X - PAIR STORAGE - REPLACE LOCKSET ONLY

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	STOREROOM LOCK	L9080HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
	EA	BALANCE HARDWARE EXISTING TO REMAIN	EXISTING DOOR/FRAME REUSED		B/O

HARDWARE SET IS A GUIDELINE.
GENERAL CONTRACTOR/HW SUPPLIER FIELD-VERIFY EXISTING CONDITIONS PRIOR TO SUBMITTAL/ORDERING. PROVIDE/REPLACE ALL PRODUCTS/COMPONENTS NECESSARY FOR COMPLETE, FUNCTIONING COMPLIANT OPENING. ADVISE ARCHITECT OF ANY INCOMPATIBILITY REGARDING DOOR/FRAME/HARDWARE. GC AND HARDWARE SUPPLIER TO REVIEW ALL OPENINGS/HARDWARE SETS WITH OWNER/ARCHITECT AT LATER DATE TO DETERMINE EXACT REQUIREMENTS.
IN SUBMITTAL PROVIDE NAME, COMPANY AND DATE OF FIELD VERIFICATION. REPLACE ANY EXISTING MECHANICAL/ELECTRICAL HARDWARE THAT DOES NOT OPERATE PROPERLY.
PROVIDE FILLER/COVER PLATES/BONDO/ETC WHERE REQUIRED.

Hardware Group No. 503 - SGL CLASSROOM LOCK

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 QTY/SIZE REQD	652	IVE
1	EA	CLASSROOM LOCK	L9070HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 503GTW - SGL CLASSROOM LOCK

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 5 X 4.5 QTY/SIZE REQD	652	IVE
1	EA	CLASSROOM LOCK	L9070HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
1	EA	HEADER SEAL	429AA-1PC-HEADER WIDTH	AA	ZER
1	EA	JAMB SEAL	870AA-S (2PCS JAMB HEIGHT)	AA	ZER
1	EA	DOOR BOTTOM	369AA/3551AA-Z49 (WD/MD AS REQ)	AA	ZER

Hardware Group No. 553 - SGL STORAGE LOCK (CLASSROOM)

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP QTY/SIZE REQD	652	IVE
1	EA	CLASSROOM SECURITY	L9071HD 17A	626	SCH
2	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 553X - SGL STORAGE LOCK (CLASSROOM)

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP QTY/SIZE REQD	652	IVE
1	EA	CLASSROOM SECURITY	L9071HD 17A	626	SCH
2	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

REVIEW EXISTING HINGE/HANGING DEVICE AND COORDINATE FOR 180-DEGREE SWING.
HARDWARE SET IS A GUIDELINE.
GENERAL CONTRACTOR/HW SUPPLIER FIELD-VERIFY EXISTING CONDITIONS PRIOR TO SUBMITTAL/ORDERING. PROVIDE/REPLACE ALL PRODUCTS/COMPONENTS NECESSARY FOR COMPLETE, FUNCTIONING COMPLIANT OPENING. ADVISE ARCHITECT OF ANY INCOMPATIBILITY REGARDING DOOR/FRAME/HARDWARE. GC AND HARDWARE SUPPLIER TO REVIEW ALL OPENINGS/HARDWARE SETS WITH OWNER/ARCHITECT AT LATER DATE TO DETERMINE EXACT REQUIREMENTS.
IN SUBMITTAL PROVIDE NAME, COMPANY AND DATE OF FIELD VERIFICATION. REPLACE ANY EXISTING MECHANICAL/ELECTRICAL HARDWARE THAT DOES NOT OPERATE PROPERLY.
PROVIDE FILLER/COVER PLATES/BONDO/ETC WHERE REQUIRED.

Hardware Group No. 710MAC - PAIR EXIT DEV - VEST (ALUM)

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	KEYED MULLION	KR4954-STAB-MT54	689	VON
2	EA	PANIC HARDWARE	CD-99-EO-SNB	626	VON
4	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
3	EA	SFIC MORT CYLINDER	80-132 W/KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	80-159 W/KEYED CONST. CORE	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP-SCUSH-SNB	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
	SET	SEAL	PERIMETER SEAL BY FRAME MFR.		
	EA	BALANCE HARDWARE	BY DOOR MFG		B/O

Hardware Group No. 710MGC - PAIR PANIC DEV

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	REMOVABLE MULLION	KR4954-STAB-MT54	689	VON
2	EA	PANIC HARDWARE	CD-99-EO-SNB	626	VON
4	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
3	EA	SFIC MORT CYLINDER	80-132 W/KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	80-159 W/KEYED CONST. CORE	626	SCH
1	EA	DOOR PULL	VR910 DT SNB	630	IVE
1	EA	DOOR PULL	VR910 NL SNB	630	IVE
2	EA	SURFACE CLOSER	4040XP-SCUSH-SNB	689	LCN
1	EA	HEADER SEAL	429AA-1PC-HEADER WIDTH	AA	ZER
1	EA	JAMB SEAL	870AA-S (2PCS JAMB HEIGHT)	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	545A-FRAME WIDTH	A	ZER

Hardware Group No. 711G - SGL EXIT DEV ACOUSTIC SEAL / NON-STC RATED

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	PANIC HARDWARE	CD-99-EO-SNB	626	VON
2	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	SFIC MORT CYLINDER	80-132 W/KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	80-159 W/KEYED CONST. CORE	626	SCH
1	EA	DOOR PULL	VR910 NL SNB	630	IVE
1	EA	SURFACE CLOSER	4040XP-RW/PA/EDA-TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS WHERE APPLICABLE	630	IVE
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
1	EA	HEADER SEAL	429AA-1PC-HEADER WIDTH	AA	ZER
1	EA	JAMB SEAL	870AA-S (2PCS JAMB HEIGHT)	AA	ZER
1	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	SADDLE THRESHOLD	545-V3-FRAME WIDTH	A	ZER

Hardware Group No. 720DRHW - D=DOUBLE EGRESS / MAGNETIC HOLD-OPEN

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
2	EA	FIRE EXIT HARDWARE	9947-EO-F-LBR (WDC @ WD) LENGTH & HEIGHT AS REQ	626	VON
2	EA	SURFACE CLOSER	4040XP-RW/PA/EDA-TBSRT	689	LCN
2	EA	FIRE/LIFE WALL MAG	SEM7800 SERIES AS REQUIRED	689	LCN
1	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	OVERLAPPING ASTRAGAL	383AA/383FSAA AS REQ (OMIT WHERE SUPPLIED BY DOOR MFR)	AA	ZER

DOORS TO RELEASE UPON FIRE ALARM ACTIVATION

Hardware Group No. 800VG - PAIR PANIC DEV

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
2	EA	DUMMY PUSH BAR	330	626	VON
2	EA	DOOR PULL	VR910 DT SNB	630	IVE
2	EA	SURFACE CLOSER	4040XP-SCUSH-SNB	689	LCN
1	EA	MEETING STILE	328AA (2 PCS - 1 SET) HEIGHT AS REQUIRED	AA	ZER
1	EA	HEADER SEAL	429AA-1PC-HEADER WIDTH	AA	ZER
1	EA	JAMB SEAL	870AA-S (2PCS JAMB HEIGHT)	AA	ZER
2	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	545A-FRAME WIDTH	A	ZER

Hardware Group No. C201 - SGL LOCK - ACCESS CONTROLLED (WHERE NOTED AND IDF/MDF)

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5 NRP QTY/SIZE REQD	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092HDEU 17A CON 12/24 VDC	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP-RW/PA/EDA-TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	VARIABLE LENGTH WIRE HARNESS	CON-XXP LENGTH AS REQ		SCH
1	EA	WIRING HARNESS (6")	CON-6W (FOR CONNECTION TO FIELD WIRING)		SCH
	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		B/O
	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		B/O
	EA	DOOR CONTACT	BY SECURITY CONTRACTOR		B/O

Hardware Group No. C714M - PAIR EXIT DEV EXTERIOR (HM) ACCESS CONTROLLED

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HEIGHT REQD	630	IVE
1	EA	CONT. HINGE	700 EPT-HEIGHT REQD	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED MULLION	KR4954-STAB-MT54	689	VON
1	EA	PANIC HARDWARE	CD-99-EO-SNB	626	VON
1	EA	ELEC PANIC HARDWARE	QEL-99-EO-CON-SNB 24 VDC	626	VON
3	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
2	EA	SFIC MORT CYLINDER	80-132 W/KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	80-159 W/KEYED CONST. CORE	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP-SCUSH-SNB	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS WHERE APPLICABLE	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	JAMB SEAL	328AA-2PC-JAMB HEIGHT	AA	ZER
1	EA	HEADER SEAL	429AA-1PC-HEADER WIDTH	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-EV3-FRAME WIDTH (OR AS DETAILED)	A	ZER
1	EA	VARIABLE LENGTH WIRE HARNESS	CON-XXP LENGTH AS REQ		SCH
1	EA	WIRING HARNESS (6")	CON-6W (FOR CONNECTION TO FIELD WIRING)		SCH
	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		B/O
	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		B/O
	EA	DOOR CONTACT	BY SECURITY CONTRACTOR		B/O

Hardware Group No. C714MA - PAIR EXIT DEV EXTERIOR (ALUM) ACCESS CONTROLLED

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY HEIGHT AS REQ	628	IVE
1	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED MULLION	KR4954-STAB-MT54	689	VON
1	EA	PANIC HARDWARE	CD-99-EO-SNB	626	VON
1	EA	ELEC PANIC HARDWARE	QEL-99-EO-CON-SNB 24 VDC	626	VON
3	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
2	EA	SFIC MORT CYLINDER	80-132 W/KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	80-159 W/KEYED CONST. CORE	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP-SCUSH-SNB	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
	SET	SEAL	PERIMETER SEAL BY FRAME MFR.		
	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR.		
2	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-EV3-FRAME WIDTH (OR AS DETAILED)	A	ZER
1	EA	VARIABLE LENGTH WIRE HARNESS	CON-XXP LENGTH AS REQ		SCH
1	EA	WIRING HARNESS (6")	CON-6W (FOR CONNECTION TO FIELD WIRING)		SCH
	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		B/O
	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		B/O
	EA	DOOR CONTACT	BY SECURITY CONTRACTOR		B/O

Hardware Group No. C714MX - PAIR EXIT DEV EXTERIOR (HM) ACCESS CONTROLLED

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HEIGHT REQD	630	IVE
1	EA	CONT. HINGE	700 EPT-HEIGHT REQD	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED MULLION	KR4954-STAB-MT54	689	VON
1	EA	PANIC HARDWARE	CD-99-EO-SNB	626	VON
1	EA	ELEC PANIC HARDWARE	QEL-99-EO-CON-SNB 24 VDC	626	VON
3	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
2	EA	SFIC MORT CYLINDER	80-132 W/KEYED CONST. CORE	626	SCH
1	EA	SFIC RIM CYLINDER	80-159 W/KEYED CONST. CORE	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP-SCUSH-SNB	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS WHERE APPLICABLE	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	JAMB SEAL	328AA-2PC-JAMB HEIGHT	AA	ZER
1	EA	HEADER SEAL	429AA-1PC-HEADER WIDTH	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-EV3-FRAME WIDTH (OR AS DETAILED)	A	ZER
1	EA	VARIABLE LENGTH WIRE HARNESS	CON-XXP LENGTH AS REQ		SCH
1	EA	WIRING HARNESS (6")	CON-6W (FOR CONNECTION TO FIELD WIRING)		SCH
	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		B/O
	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		B/O
	EA	DOOR CONTACT	BY SECURITY CONTRACTOR		B/O

PROVIDE EITHER EPT OR SURFACE DOOR LOOP AS REQD. (DEPENDING ON IF THE DOORS/FRAME ARE REPLACED ENTIRELY, OR PARTIAL REUSED)

HARDWARE SET IS A GUIDELINE.
GENERAL CONTRACTOR/HW SUPPLIER FIELD-VERIFY EXISTING CONDITIONS PRIOR TO SUBMITTAL/ORDERING. PROVIDE/REPLACE ALL PRODUCTS/COMPONENTS NECESSARY FOR COMPLETE, FUNCTIONING COMPLIANT OPENING. ADVISE ARCHITECT OF ANY INCOMPATIBILITY REGARDING DOOR/FRAME/HARDWARE. GC AND HARDWARE SUPPLIER TO REVIEW ALL OPENINGS/HARDWARE SETS WITH OWNER/ARCHITECT AT LATER DATE TO DETERMINE EXACT REQUIREMENTS.
IN SUBMITTAL PROVIDE NAME, COMPANY AND DATE OF FIELD VERIFICATION. REPLACE ANY EXISTING MECHANICAL/ELECTRICAL HARDWARE THAT DOES NOT OPERATE PROPERLY.
PROVIDE FILLER/COVER PLATES/BONDO/ETC WHERE REQUIRED.

Hardware Group No. C715 - SGL EXIT DEV EXTERIOR (HM) ACCESS CONTROLLED

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700 EPT-HEIGHT REQD	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	QEL-99-EO-CON-SNB 24 VDC	626	VON
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	SFIC RIM CYLINDER	80-159 W/KEYED CONST. CORE	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP-SCUSH-SNB	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS WHERE APPLICABLE	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	JAMB SEAL	328AA-2PC-JAMB HEIGHT	AA	ZER
1	EA	HEADER SEAL	429AA-1PC-HEADER WIDTH	AA	ZER
1	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-EV3-FRAME WIDTH (OR AS DETAILED)	A	ZER
1	EA	VARIABLE LENGTH WIRE HARNESS	CON-XXP LENGTH AS REQ		SCH
1	EA	WIRING HARNESS (6")	CON-6W (FOR CONNECTION TO FIELD WIRING)		SCH
	EA	CREDENTIAL READER	BY SECURITY CONTRACTOR		B/O
	EA	POWER SUPPLY	BY SECURITY CONTRACTOR		B/O
	EA	DOOR CONTACT	BY SECURITY CONTRACTOR		B/O

Hardware Group No. S503 - S=STC DOOR - BASIS OF DESIGN HARDWARE SET FOR OTHER MFR I.E.. KREIGER OR OVERLY

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA	HINGE/PIVOTS	PROVIDED BY SOUND DOOR MFG		B/O
1	EA	CLASSROOM LOCK	L9070HD 17A	626	SCH
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
	EA	BALANCE OF HARDWARE	PROVIDED BY SOUND DOOR MFG		B/O
1	EA	STRIKE & CLOSER MOUNTING BRACKETS	328SPB/870SPB/770SPB (AS REQD)		ZER

BASIS OF DESIGN HARDWARE SET
-ALL HARDWARE SPECIFIED MUST BE APPROVED/COORDINATED WITH THE STC DOOR MFR. PRIOR TO ORDERING DOORS, FRAMES AND HARDWARE.
-A STANDARD STC UNIT IS SUPPLIED WITH NECESSARY HINGES, PERIMETER GASKETING AND RETAINER, DOOR BOTTOM, LOOSE STOPS, STOP OFFSET HARDWARE BRACKETS AND ALL REQUIRED FASTENERS.
-CLOSERS WITH EDA OR CUSH (RIGID TYPE ARMS) NOT ALLOWED WITH CAM-LIFT HINGES.

Hardware Group No. S553 - S=STC DOOR - BASIS OF DESIGN HARDWARE SET FOR OTHER MFR I.E.. KREIGER OR OVERLY

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA	HINGE/PIVOTS	PROVIDED BY SOUND DOOR MFG		B/O
1	EA	CLASSROOM SECURITY	L9071HD 17A	626	SCH
2	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
	EA	BALANCE OF HARDWARE	PROVIDED BY SOUND DOOR MFG		B/O
1	EA	STRIKE & CLOSER MOUNTING BRACKETS	328SPB/870SPB/770SPB (AS REQD)		ZER

BASIS OF DESIGN HARDWARE SET
-ALL HARDWARE SPECIFIED MUST BE APPROVED/COORDINATED WITH THE STC DOOR MFR. PRIOR TO ORDERING DOORS, FRAMES AND HARDWARE.
-A STANDARD STC UNIT IS SUPPLIED WITH NECESSARY HINGES, PERIMETER GASKETING AND RETAINER, DOOR BOTTOM, LOOSE STOPS, STOP OFFSET HARDWARE BRACKETS AND ALL REQUIRED FASTENERS.
-CLOSERS WITH EDA OR CUSH (RIGID TYPE ARMS) NOT ALLOWED WITH CAM-LIFT HINGES.

Hardware Group No. S701 - S=STC DOOR - BASIS OF DESIGN HARDWARE SET FOR OTHER MFR I.E.. KREIGER OR OVERLY

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA	HINGE/PIVOTS	PROVIDED BY SOUND DOOR MFG		B/O
1	EA	PANIC HARDWARE	99-L-17-SNB	626	VON
1	EA	SFIC EVEREST PERM CORE	80-037 CKC EV29 R	626	SCH
1	EA	SFIC RIM CYLINDER	80-159 W/KEYED CONST. CORE	626	SCH
1	EA	SURFACE CLOSER	4040XP-TBSRT-MOUNTING/ARM/BRKT A REQD	689	LCN
1	EA	DOOR STOP (TYPE REQD)	WS406/WS407CCV/FS436/OH STOP - AS REQD	626	IVE
	EA	BALANCE OF HARDWARE	PROVIDED BY SOUND DOOR MFG		B/O
1	EA	STRIKE & CLOSER MOUNTING BRACKETS	328SPB/870SPB/770SPB (AS REQD)		ZER

BASIS OF DESIGN HARDWARE SET
-ALL HARDWARE SPECIFIED MUST BE APPROVED/COORDINATED WITH THE STC DOOR MFR. PRIOR TO ORDERING DOORS, FRAMES AND HARDWARE.
-A STANDARD STC UNIT IS SUPPLIED WITH NECESSARY HINGES, PERIMETER GASKETING AND RETAINER, DOOR BOTTOM, LOOSE STOPS, STOP OFFSET HARDWARE BRACKETS AND ALL REQUIRED FASTENERS.
-CLOSERS WITH EDA OR CUSH (RIGID TYPE ARMS) NOT ALLOWED WITH CAM-LIFT HINGES.

END OF SECTION

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
1. Glass products.
2. Laminated glass.
3. Insulating glass.
4. Glazing sealants.
5. Glazing tapes.
6. Miscellaneous glazing materials.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product; 12 inches square.

C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturers of insulating-glass units with sputter-coated, low-E coatings, glass testing agency, and sealant testing agency.

B. Product Certificates: For glass.

C. Product Test Reports: For tinted glass coated glass insulating glass and glazing sealants, for tests performed by a qualified testing agency.

D. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

E. Preconstruction adhesion and compatibility test report.

F. Sample Warranties: For special warranties.

1.8 QUALITY ASSURANCE

A. The work of this section shall be performed by a company which specializes in the type of glazing work required for this Project, with a minimum of 5 years of documented successful experience and shall be performed by skilled workmen thoroughly experienced in the necessary crafts
   1. Work shall be performed in compliance with Owner's insurance underwriters' requirements and UL approvals and testing for materials, assemblies and procedures

B. Manufacturer shall specialize in manufacturing the type of glazing specified in this section, with a minimum of 5 years of documented successful experience, and have the facilities capable of meeting all requirements of Contract Documents as a single-source responsibility and warranty
   1. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source
   2. Producer of fritted type coatings shall have a minimum of 5 years' experience in the production of ceramic frit coating in quantities similar to quantities required for this Project

C. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

D. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

E. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

F. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

G. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Install glazing in mockups specified in Section "Aluminum-Framed Entrances and Storefronts to match glazing systems required for Project, including glazing methods.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
   4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
   5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

C. Remove from the job site and replace with acceptable material all cracked, broken, chipped or otherwise damaged glass, and all glazing and sealing materials unfit for use.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
   1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.12 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
   1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
   1. Warranty Period: Ten years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide product indicated in glass schedules or comparable product by one of the following:
   1. Guardian Industries Corp.
   2. Oldcastle Building Envelope.
   3. Pilkington North America Inc.
   4. Viracon, Inc.

B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

D. Non-domestic glass not acceptable.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
   1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
      a. Wind Design Data: As indicated on Drawings.
   2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
   3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
   4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

D. Safety Glazing: Where safety glazing is required by the safety glazing code, provide glazing that complies with 16 CFR 1201, Category II.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites .
   2. For laminated-glass lites, properties are based on products of construction indicated.
   3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
   4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
   5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
   6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

A. Flatness Tolerances:
   1. Maximum Distortion Tolerances for Roll Wave Millidiopter Measurement:
      a. Glass to be heat treated in a plant utilizing convection furnaces and on-line diagnostic tools, Osprey Lite Measurement System or meeting the test criteria of the three contact gauge or flat bottom gauge described in ASTM C1651-1.
      b. Roll-Wave or Ripple: The deviation form flatness at any peak to valley shall be targeted not exceed .003” as measured per peak to valley for ¼” thick glass. The leading and trailing 10” edges of lite may exceed the targeted .003” and the deviation is allowable up to .008”.
      c. Millidiopter: Surface quality of the lites to 90% surface coverage measured at Maximum + or _ 120 millidiopters overall.
      d. Documentation of Quality Assurance Procedures will be performed on a regular statistical basis, in accordance with ISO 9001-2008 documents, and available upon request.
   2. Bow and Warp Tolerance: Offline Measurement
      a. Maximum of ½ of ASTM C1048 Specification.
      b. Every Hour on Vertical Plane with aluminum straight edge / or tight string.
      c. Documentation of Quality Assurance Procedures will be performed on a regular statistical basis, in accordance with ISO 9001-2008 documents, and available upon request.
      d. Glass to be heat-treated by horizontal (roller hearth) process with inherent roll-wave distortion parallel to the bottom edge of the glass as installed when specified.

B. Glass Damages: Glazing shall comply with ASTM C1036 in regard to permitted glass damages and blemishes. However, Architect Engineer reserves the right to reject glass conditions which may be permitted by the testing standard.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
   2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is required, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
1. Minimum Glass Thickness for Exterior Lites: 6 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

E. Glass shall be annealed, heat strengthened, or fully tempered, as specified, required, or as recommended by the glass manufacturer to insure against heat breakage; to assure adequate glass performance at the specified design pressures; and assure adequate performance under test conditions specified under the performance criteria specified in the respective glass framing specification sections.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Ultraclear/Low Iron Float Glass: ASTM C 1036, Type I, Class I, Quality-Q3, and with visible light transmission not less than 91 percent.
1. Products: Subject to compliance with requirements, provide one of the following:
a. AGC Glass Company North America, Inc.; Krystal Klear.
b. Guardian Industries Corp.; UltraWhite.
c. Pilkington North America; Optiwhite.
d. PPG Industries, Inc.; Starphire.
e. Saint-Gobain Corporation; Diamant.

C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.1 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction: Laminate glass with SentryGlas or polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.2 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
1. Shall comply with ASTM E2190 Standard Specification for Insulating Glass Unit Performance and Evaluation
a. Units shall be certified for compliance by the IGCC in accordance with the above ASTM test method
2. The unit overall thickness tolerance shall be -1/16” (1.59 mm) / +1/32” (0.79mm). Unit constructed with patterned or laminated glass shall be +/- 1/16” (1.59 mm)
3. Shall comply with ASTM E546 Standard Test Method for Frost Point of Sealed Insulating Glass Units
4. Shall comply with ASTM E576 Standard Test Method for Frost Point of Sealed Insulating Glass Units in the Vertical Position

5. Sealing System: Sealing Insulating Glass Units to be double sealed with a primary seal of polyisobutylene and a secondary sealants seal of silicone.
    a. The minimum thickness of the secondary seal shall be 1/16” (1.59 mm)
    b. The target width of the primary seal shall be 5/32” (3.97 mm)
    c. There shall be no voids or skips in the primary seal
    d. Up to a specific maximum of 3/32” of the air spacer material, coordinate may be visible above the primary polyisobutylene sealant
    e. Gaps or skips between primary and secondary sealant are permitted to a maximum width of 1/16” (1.59 mm) by maximum length of 2” (51 mm) with manufacturers and products gaps separated by at least 18” (457 mm). Continuous contact between the primary seal and the secondary seal is desired
6. To provide a hermetically sealed and dehydrated space, lites shall be separated by a spacer with three bent corners and one keyed-soldered corner or four bent corners and one straight butyl injected zinc plated steel straight key joint
7. Spacer: Aluminum with black, color anodic finish.
8. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.3 GLAZING SEALANTS

A. General:
1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
    a. Dow Corning Corporation; Dowsill 790.
    b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
    c. Pecora Corporation; 890NST.
    d. Tremco Incorporated; Spectrem 1.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
    a. Dow Corning Corporation; Dowsill 795 .
    b. GE Advanced Materials - Silicones**;** SilGlaze II SCS2800 .
    c. Pecora Corporation; 864.
    d. Tremco Incorporated; Spectrem 2.

A. Two-Component Factory Applied Structural Sealant:
1. Dow; Dowsill 983 or similar
2. GE Silicones; SSG4600 UltraGlaze

2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.5 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Silicone with a Shore, Type A durometer hardness of 85, plus or minus 5 and that is compatible with the Insulated Glass Units edge seal.

D. Spacers: Silicone blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Silicone of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material) and Type B (in wet areas), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.6 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
   1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
      a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep systems.
   3. Minimum required face and edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

F. Lock Strip Gasket Glazing: Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 GLASS SCHEDULE

A. Refer to Master Schedule

END OF SECTION

SECTION 08 87 00 - GLAZING SURFACE FILMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes film products applied to glass surfaces.
   1. Standard Glazing surface film

1.2 ACTION SUBMITTALS

A. Product Data: For each film product indicated.

B. Samples for Color Selection: Manufacturer's standard sample sets showing the full range of colors available for each type of product indicated.

C. Samples for Verification: 12-inch square samples of each type of glazing film specified, in color specified.

D. Shop Drawings: identify location for each type of film indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 CLOSEOUT SUBMITTALS

A. Warranty: Special warranty specified in this Section.

B. Maintenance Data and Replacement Instructions: For each type of film overlay to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage a firm experienced in manufacturing systems similar to those indicated for this Project and meeting the standards of the International Standards Organization (ISO), ISO 9001 Quality Assurance in Production and Installation.

B. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by film manufacturer as having the necessary experience, staff, and training to install manufacturer's products according to specified requirements.

C. Source Limitations: Obtain each type of film overlay through one source from a single manufacturer to provide products of consistent quality in appearance and physical properties.

D. Mockups: Apply glazing films in locations as directed to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
   1. Obtain approval of field samples before continuing with remainder of installation.
   2. Maintain field samples during remainder of installation in an undisturbed condition as a standard for judging the completed Work.
   3. Approved field samples may become part of the completed Work.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
   1. Conduct pre-installation conference in conjunction with installation of mockup.
   2. Meet with Owner, Architect, glazing film Installer and glazing film manufacturer's representative.
   3. Review methods and procedures related to installation, including manufacturer's written instructions.
   4. Examine substrate conditions for compliance with requirements.
   5. Review temporary protection measures required during and after installation.
   6. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

B. Store and protect glazing films according to manufacturer's written instructions and as needed to prevent damage, condensation, temperature changes, direct exposure to sun, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with film installation when ambient and substrate temperature conditions are outside limits permitted by manufacturer and when glass substrates are wet from frost, condensation, or other causes.

1.8 WARRANTY

A. Manufacturer's Warranty: Fully executed warranty, within 5 years from date of substantial completion.

PART 2 - PRODUCTS

2.1 STANDARD GLAZING SURFACE FILMS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CPFilms Inc.; LLumar Films.
2. 3M
3. Solyx , SimGlas
4. Huper Optik

B. Film Overlay: Single-layered applied glazing film products, applied to interior glass surfaces, consisting of the following (from outboard surface to inboard surface), as applicable to each type of film indicated:
1. Removable release liner.
2. Pressure sensitive adhesive with integral ultraviolet absorbers.
3. Clear, dyed, or printed pattern layer of polyester film.
4. Possible layer of metallized or sputtered polyester film.
5. Possible scratch resistant coating.

C. Colors: As indicated in Master Schedule.

D. Basis of Design: as listed in the Master Schedule

2.2 GLAZING FILM ACCESSORIES

A. General: Provide products complying with requirements of glazing film manufacturer for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Adhesive: Pressure Sensitive acrylic adhesive system.

C. Cleaners, Primers, and Sealers: Types recommended by glazing film manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass and surrounding adjacent surfaces for conditions affecting installation.
1. Report conditions that may adversely effect installation. In report, include description of any glass that is broken, chipped, cracked, abraded, or damaged in any way.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Immediately before beginning installation of films, clean glass surfaces of substances that could impair glazing film's bond, including mold, mildew, oil, grease, dirt and other foreign materials.

C. Blade the inside surface of window glass with industrial razors to ensure removal of foreign contaminants.

D. Protect window frames and surrounding surfaces and materials from damage during installation.

3.3 INSTALLATION

A. General: Comply with glazing film manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements are indicated.

B. Install film continuously, but not necessarily in one continuous length. Install with no gaps or overlaps.

C. If seamed, install with no gaps or overlaps. Install seams vertical and plumb. No horizontal seams allowed.

D. Do not remove release liner from film until just before each piece of film is cut and ready for installation.

E. Install film with mounting solution and custom cut to the glass with neat, square comers and edges to within 1/8 inch of the window frame.

F. Remove air bubbles, wrinkles, blisters, and other defects.

G. After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, banding, thin spots or pinholes.
1. If installed film does not meet this criteria, remove and replace with new film.

3.4 CLEANING

A. Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.

B. After application of film, wash film using cleaning methods recommended by glazing film manufacturer. Do not use abrasive-type cleaning agents or bristle brushes.

C. Replace films that cannot be cleaned.

END OF SECTION

SECTION 08 91 19 - FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Fixed, extruded-aluminum louvers.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Vertical Louver: Louver with vertical blades (i.e., the axes of the blades are vertical).

D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Delegated-Design Submittal: For louvers indicated to comply with structural performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

B. Windborne-debris-impact-resistance test reports.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Louver :
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Airolite Company, LLC (The).
b. Construction Specialties, Inc.
c. Greenheck Fan Corporation.
d. Ruskin Company; Tomkins PLC.
2. Basis of Design: Refer to Architect’s Master Schedule.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.
1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
1. Metal: Same type and form of metal as indicated for louver to which screens are attached.Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Non-rewirable, U-shaped frames.

D. Louver Screening for Aluminum Louvers:
1. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Fasteners: Use types and sizes to suit unit installation conditions.
1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
2. For color-finished louvers, use fasteners with heads that match color of louvers.

C. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
   1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
   2. Horizontal Mullions: Provide horizontal mullions at joints unless continuous vertical assemblies are indicated.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill,to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
   1. Frame Type: Channel unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.
   1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
   2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.

G. Provide subsills made of same material as louvers for recessed louvers.

H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Color and Gloss: Refer to Architect’s Master Schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
   1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 91 19

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: Submit evaluation reports certified under an independent third party inspection program administered by an agency accredited by IAS to ICC-ES AC98, IAS Accreditation Criteria for Inspection Agencies..

1.5 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

PART 2 - PRODUCTS

2.1 SUSTAINABILITY REQUIREMENTS

A. Low Emitting Requirements: Provide product that meets low emitting criteria listed in section 01 81 13.02 – Sustainable Design Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Design framing systems in accordance with American Iron and Steel Institute Publication “S220 - North American Specification for the Design of Cold-Formed Steel Framing - Nonstructural Members”, except as otherwise shown or specified.

2.3 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CEMCO Steel Framing Systems
2. ClarkDietrich Building Systems.

3. MarinoWARE.
4. Mill Steel Framing

B. Framing Members, General: Comply with AISI S 200 and ASTM C 645 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120) or DiamondPlus coating; roll-formed from steel meeting mechanical and chemical requirements of ASTM A 1003 with a zinc-based coating. Galvannealed products are not acceptable.,
a. Coatings shall demonstrate equivalent corrosion resistance with an evaluation report acceptable to the authorities having jurisdiction.

C. Studs and Runners: ASTM C 645.
1. Steel Studs and Runners:
a. Minimum Base-Steel Thickness: 25 gage unless indicated otherwise on Drawings or below.
1) Interior Metal Stud/Gypsum Board Assemblies, Typical Locations: Withstand lateral loading (air pressure) of 5 psf with deflection limit not more than L/240 of partition height.
2) Interior Metal Stud/Gypsum Board Assemblies at Atriums, Lobbies, Service Corridors, Exit Corridors, Elevator Lobbies, Vertical Shafts, and walls receiving plaster veneer: Withstand lateral loading (air pressure) of 7.5 psf with deflection limit not more than L/360 of partition height
3) Interior Metal Stud/Gypsum Board Assemblies at Locations with Ceramic Tile or Other Hard Surface Finishes: Withstand typical lateral loading (air pressure) with deflection limit not more than L/360 of partition height, minimum 20 gage studs at 16 inches on center.
4) Where wall mounted equipment, woodwork, and casework items are indicated or elsewhere as shown on Drawings, provide minimum 16 gage studs
5) At jambs of openings provide two minimum 20 gage studs.
6) Ceilings: At ceilings using mold-mildew resistant gypsum framing to be 16 inches o.c. for 5/8 inches gypsum
7) Refer to Division 5 for stud framing which is exposed to wind loads and for studs carrying heavy vertical loads (cement plaster, manufactured stone masonry, stone tile thicker than 3/4 inch, etc.)
b. Where partition heights exceed stud manufacturer’s recommended spans, provide one of the following:
1) Heavier stud gage.
2) Closer stud spacing.
3) Deeper stud size (space permitting); As approved by Architect.
4) Above ceiling bracing, anchored to structure above.
c. Depth: As indicated on Drawings.
1. Equivalent Gauge Steel Studs and Runners:
a. Product: ClarkDietrich Building Systems; ProSTUD 25 (25EQ) and ProTRAK 25 (25EQ), or comparable products.
b. Minimum Base-Steel Thickness: 0.0150 inch.
2. “EQ” (Equivalent Gauge Thickness) Steel Studs and Runners: Members that can show certified third party testing with gypsum board in accordance with ICC ES AC86 (Approved August 2015) need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C 645. The submission of an evaluation report is acceptable to show conformance to this requirement.

D. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
a. Products: Subject to compliance with requirements, provide one of the following:
1) ClarkDietrich Building Systems; BlazeFrame DSL Slotted Deflection Track.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Steel Thickness: 0.018 inch.

F. Backing Plate: Proprietary fire-retardant-treated wood blocking and bracing in width indicated.

1. ClarkDietrich Building Systems; Danback Fire-Retardant Treated Wood Backing Plate D16F or D24F, or a comparable product.

G. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-steel thickness, with minimum 1/2-inch-wide flanges.
1. Product: ClarkDietrich Building Systems; Cold-Formed U-Channel and EasyClip U-Series Angle U543, U545, U547, or a comparable product.
2. Depth: As indicated on Drawings.
3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.0538-inch- thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Steel Thickness: 0.018 inch.
2. Depth: 7/8 inch.

I. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical.
2. Basis of Design: Clark Dietrich, RC Deluxe single leg resilient channel.

J. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.
1. Depth: 3/4 inch.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch.
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

2.4 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

B. Hanger Attachments to Concrete:
1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
a. Type: Postinstalled, expansion anchor.
2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.053 inch and minimum 1/2-inch- wide flanges.
1. Depth: 2-1/2 inches.

F. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
2. Steel Studs and Runners: ASTM C 645.
a. Minimum Base-Steel Thickness: 0.018 inch.
b. Depth: 1-5/8 inches.
3. Equivalent Gauge Steel Studs and Runners:
a. ClarkDietrich Building Systems; ProSTUD 25 (25EQ) and ProTRAK 25 (25 EQ), or comparable products.
b. Minimum Base-Steel Thickness: 0.0150 inch.
4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
a. Minimum Base-Metal Thickness: 0.018 inch.
5. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
a. ClarkDietrich Building Systems; RC Deluxe (RCSD) Resilient Channel

b. Configuration: Asymmetrical.

G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; Drywall Grid System.
c. USG Corporation; Drywall Suspension System.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

B. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

C. Isolation Strip at Exterior Walls: Provide the following:
1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:
1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
   2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
   3. Partitions with Security Mesh: 8 inches (203 mm) o.c., unless otherwise indicated or required to comply with span and deflection design criteria.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb unless otherwise indicated.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
      c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
      a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
   5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
   6. Curved Partitions:
      a. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.

E. Direct Furring:
   1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Furring Members:
   1. Erect insulation, specified in Section 07 21 00 "Thermal Insulation," vertically and hold in place with Z-furring members spaced 24 inches o.c.
   2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
   3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Hangers: 48 inches o.c.

2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

SECTION 09 24 00 - CEMENT PLASTERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Exterior portland cement plasterwork (stucco).

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.

C. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.

D. Samples for Verification: For each type of finish coat indicated; 12 by 12 inches, and prepared on rigid backing.

1.4 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where indicated, provide portland cement plaster assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

B. Sound-Transmission Characteristics: Where indicated, provide portland cement plaster assemblies identical to those of assemblies tested for STC ratings per ASTM E 90 and classified according to ASTM E 413 by a qualified testing agency.

C. Mockups: Before plastering, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Install mockups for each type of finish indicated.
   2. For interior plasterwork, simulate finished lighting conditions for review of mockups.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.6 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Exterior Plasterwork:
   1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
   2. Apply plaster when ambient temperature is greater than 40 deg F.
   3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

C. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

1.1 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of plaster assemblies installed in accordance with manufacturer's written instructions, that are defective and fail in materials within specified warranty period, and bear the material and labor costs associated with the repair or replacement thereof. If applicable, manufacturer will repair and/or replace sheathing or framing member damaged by moisture, caused by failure of the products to drain incidental moisture from the cavity between the insulation board and the properly installed water-resistant barrier, within the specified warranty period.

D. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL LATH

A. Expanded-Metal Lath: ASTM C 847 with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
b. CEMCO.
c. Clark Western Building Systems.
d. Dietrich Metal Framing; a Worthington Industries company.
e. MarinoWARE.
f. Phillips Manufacturing Co.
2. Diamond-Mesh Lath: Self-furring, 3.4 lb/sq. yd..

B. Paper Backing: FS UU-B-790, Type I, Grade D, Style 2 vapor-permeable paper.
1. Provide paper-backed lath at exterior locations.

2.2 ACCESSORIES

A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
b. CEMCO.
c. Clark Western Building Systems.
d. Dietrich Metal Framing; a Worthington Industries company.
e. MarinoWARE.
f. Phillips Manufacturing Co.
2. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 zinc coating.
3. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
4. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
5. Cornerbeads: Fabricated from zinc.
a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
b. Small nose cornerbead with perforated flanges; use on curved corners.
c. Small nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing masonry corners.
d. Bull nose cornerbead, radius 3/4 inch minimum, with expanded flanges; use at locations indicated on Drawings.
6. Casing Beads: Fabricated from zinc; square-edged style; with expanded flanges.
7. Control Joints: Fabricated from zinc; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
8. Expansion Joints: Fabricated from zinc; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
9. Two-Piece Expansion Joints: Fabricated from zinc; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch wide; with perforated flanges.

2.3 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in portland cement plaster.

C. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.

D. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.

E. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter, unless otherwise indicated.

2.4 PLASTER MATERIALS

A. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color to match Architect's sample.

B. Perlite Aggregate: ASTM C 35.

C. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates; for use over portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dryvit Systems, Inc.; Dryvit TAFS.
      b. Finestone, BASF Wall Systems, Inc.; PebbleTex.
      c. LaHabra, a brand of ParexLaHabra, Inc.; Acrylic Finish.
      d. Parex, Inc., a brand of ParexLaHabra, Inc.; e-lastic.
      e. Senergy, BASF Wall Systems, Inc.; Senerflex.
      f. Sto Corp.; Powerwall Finish.
   2. Color: As indicated on Master Schedule.

2.5 PLASTER MIXES

A. General: Comply with ASTM C 926 for applications indicated.
   1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.

B. Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat plasters acrylic-based finish coatings, comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.3 INSTALLATION, GENERAL

A. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.

3.4 INSTALLING METAL LATH

A. Expanded-Metal Lath: Install according to ASTM C 1063.
   1. Partition Framing and Vertical Furring: Install flat diamond-mesh lath.
   2. Flat-Ceiling and Horizontal Framing: Install flat diamond-mesh lath.
   3. Curved-Ceiling Framing: Install flat diamond-mesh lath.
   4. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh lath.

3.5 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.

B. Reinforcement for External Corners:
   1. Install lath-type, external-corner reinforcement at exterior locations.
   2. Install cornerbead at interior and exterior locations.

C. Control Joints: Install control joints at locations indicated on Drawings or in specific locations approved by Architect for visual effect as follows:
   1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
      a. Vertical Surfaces: 144 sq. ft..
      b. Horizontal and other Nonvertical Surfaces: 100 sq. ft..
   2. At distances between control joints of not greater than 18 feet o.c.
   3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
   4. Where control joints occur in surface of construction directly behind plaster.
   5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.6 PLASTER APPLICATION

A. General: Comply with ASTM C 926.
   1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.
   2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
   3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Walls; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4-inch thickness.

C. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4 inch thick.

D. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

E. Concealed Exterior Plasterwork: Where plaster application will be used as a base for adhered finishes, omit finish coat.

F. Concealed Interior Plasterwork:
   1. Where plaster application will be concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
   2. Where plaster application will be concealed above suspended ceilings and in similar locations, finish coat may be omitted.
   3. Where plaster application will be used as a base for adhesive application of tile and similar finishes, omit finish coat.

3.7 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.8 PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 24 00

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Interior gypsum board.
2. Specialty Gypsum Board
3. Tile backing panels.
4. Trim Accessories

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Install mockups for the following:
a. Each level of gypsum board finish indicated for use in exposed locations.
2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. All gypsum board to be Moisture resistant gypsum tile backer board except where called out to be Cement tile backer board in wet areas. (Corridor walls and Entire Restroom)

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

D. Install cavity wall insulation and interior gypsum board only after building is enclosed with exterior wall assembly as detailed in the drawings.

PART 2 - PRODUCTS

2.1 SUSTAINABILITY REQUIREMENTS

A. Low Emitting Requirements: Provide product that meets low emitting criteria listed in section 01 81 13.02 – Sustainable Design Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.3 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.4 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. National Gypsum Company.
   2. USG Corporation.

B. Gypsum Board ASTM C 1396/C 1396M.
   1. Products:
      a. National Gypsum, Purple XP Drywall.
      b. USG Corporation, Brand UltraLight Panels Mold Tough.
   2. Thickness: 5/8 inch.
   3. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
   1. Thickness: 5/8 inch.
   2. Long Edges: Tapered.

2.5 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. National Gypsum Company; Gold Bond Fire-Shield C.
      b. USG Corporation; Firecode C Core.
   2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
   3. Long Edges: Tapered.

B. Acoustically Enhanced Gypsum Board: ASTM C 1396/C 1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. National Gypsum Company; Sound Break.
   2. Core: 5/8 inch, Type X .
   3. Long Edges: Tapered.

2.6 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. National Gypsum; eXP Tile Backer.
      b. USG Corporation; DUROCK Glass Mat Tile Backerboard.
   2. Core: 5/8 inch, Type X.
   3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. National Gypsum Company, Permabase Cement Board.
      b. USG Corporation; DUROCK Cement Board.
   2. Thickness: 5/8 inch.
   3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

C. Schedule:
   1. Wet areas and Corridors – Cementitious Backer Unit
   2. Large Format Tile (>15 inches) - Cementitious Backer Unit
   3. Dry areas – Glass-Mat Backing Board

2.7 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbead.
      b. Bullnose bead.
      c. LC-Bead: J-shaped; exposed long flange receives joint compound.
      d. L-Bead: L-shaped; exposed long flange receives joint compound.
      e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      f. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Fry Reglet Corp.
      b. Gordon, Inc.
      c. Pittcon Industries.
   2. Basis of Design: Refer to Architect’s Master Schedule
   3. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.

C. Drywall Accessories: Provide extruded PVC gypsum drywall moisture guard installed continuously at floor level of drywall throughout building.
   1. Basis of Design: Subject to compliance with requirements, provide “Waterguard” manufactured by Waterguard-USA or comparable products approved in writing by Architect.
      a. Size:
         1) Height:
            a) Typical Walls: 1/2-inch.
            b) Corridor Walls: 1-3/4-inches.
         2) Thickness: Size to accommodate drywall thickness.

2.8 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
   1. Interior Gypsum Board: Paper.
   2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use drying-type, all-purpose compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.
   5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:
   1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.9 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Pecora Corporation; AC-20 FTR or AIS-919.
      b. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
      c. USG Corporation; SHEETROCK Acoustical Sealant.
   2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Moisture Resistant Board: Vertical surfaces unless otherwise indicated.
   2. Ceiling Type: Ceiling surfaces.
   3. Acoustically Enhanced Type: As indicated on Drawings.
   4. Tile Backing Panels:
      a. Wet areas and Corridors – Cementitious Backer Unit
      b. Large Format Tile (>15 inches) - Cementitious Backer Unit
      c. Dry areas – Glass-Mat Backing Board

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels vertically (parallel to framing unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
      b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
   1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
   2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
   4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
   5. All MDF/ IDF Rooms are double layered drywall on both sides.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

A. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings according to ASTM C 840 and in specific locations approved by Architect for visual effect.
   1. Wall: Control joints shall be installed where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear feet, or 900 sq ft.
   2. Provide control joints at all openings (Doors, Windows, Cased)
   3. Ceiling with Perimeter relief: Control joints in interior ceilings with perimeter relief shall be installed so that linear dimensions between control joints do not exceed 50 ft or 2500 sq. ft
   4. Ceiling, without perimeter relief: Control joints in interior ceilings without perimeter relief shall be installed so that linear dimensions between control joints do not exceed 30 ft
   5. Exterior: Control joints in exterior ceilings and soffits shall be installed so that linear dimensions between control joints do not exceed 30 ft. at acoustical or fire-rated walls: Where a control joint occurs in an acoustical or fire rated system, blocking shall be provided behind the control joint by using a backing material such as 5/8 in. type X gypsum panel products, mineral fiber, or other tested equivalent.

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners unless otherwise indicated.
   2. Bullnose Bead: Use where indicated.
   3. LC-Bead: Use at exposed panel edges.
   4. L-Bead: Use where indicated.
   5. U-Bead: Use where indicated.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
      a. Primer and its application to surfaces are specified in Section 09 91 00 "Painting."
      b. Provide minimum Level 4 finish on all painted drywall partitions.
   2. Level 5: Where indicated on Drawings.
      a. Primer and its application to surfaces are specified in Section 09 91 00 "Painting."

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 00 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Porcelain tile.
2. Waterproof membrane.
3. Crack isolation membrane.
4. Metal edge strips.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
1. Show locations of each type of tile and tile pattern.
2. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.

D. Samples for Verification:
1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product.

D. Product Test Reports: For tile-setting and -grouting products.

E. Slip Resistance Testing Results: Submit test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of flooring with requirements specified for slip resistance.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 2 percent of amount installed for each type, composition, color, pattern, and size indicated or two full unopened containers, whichever is greater.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
   2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
   3. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.
   4. Installer employ at least one individual for the project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of large format tile and substrate preparation, membranes, mud (mortar bed) floors, mud (mortar) walls, shower receptors.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup of each type of floor tile installation.
   2. Build mockup of each type of wall tile installation.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SUSTAINABILITY REQUIREMENTS

A. Low Emitting Requirements: Provide product that meets low emitting criteria listed in section 01 81 13.02 “Sustainable Design Requirements.”

2.2 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
   1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
   1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
   2. Obtain waterproof membrane and crack suppressant membranes, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
   1. Waterproof membrane.
   2. Crack isolation membrane.

2.3 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
   1. Where tile is indicated for installation on exteriors, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.4 PORCELAIN TILE

A. Acceptable Manufacturers:
   1. American Olean.
   2. Crossville Ceramics.
   3. Daltile.

B. Basis of Design: As indicated in Architect’s Master Schedule.

C. Coefficient of Friction: Tiles suitable for level interior spaces expected to be walked upon shall have a wet DCOF of 0.42 or greater when tested per the DCOF AcuTest.

D. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

2.5 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Noble Company (The); Nobleseal TS.
      b. Schluter Systems; Kerdi
      c. MAPEI Corporation; Mapeguard WP 200
   2. Nominal Thickness: 0.030 inch.

C. Fabric--Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.

b. Laticrete International, Inc.; Hydro Ban.
c. MAPEI Corporation; Mapelastic Aquadefense.
d. Texrite; Hydrorite with Texrite fibermesh.
e. Sika Corp.; SikaTile; Moisture Guard 100

2.6 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Noble Company (The); Nobleseal CIS.
b. Schluter Systems; Ditra
c. MAPEI Corporation; Mapeguard CI

C. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
b. Laticrete International, Inc.; Hydro Ban.
c. MAPEI Corporation; Mapelastic CI
d. Texrite; Hydro-rite with Texrite fibermesh.
e. Sika Corp.; SikaTile 100 Moisture Guard (crack isolation/waterproof membrane)

2.7 MORTAR BOND COAT / SETTING MATERIALS

A. Large & Heavy Tile Mortar with Polymer (formerly Medium Bed): for large, heavy, ceramic tile and stone. Used with stone or tile units (square, rectangular, plank sizes), an ANSI A118.11; product approved by manufacturer for application thickness of 5/8 inch (16 mm).
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Bostik, Inc.
b. Custom Building Products.
c. Laticrete International, Inc.; 4XLT
d. MAPEI Corporation; Keraflex Plus
e. Texrite; Total Contact
f. Sika Corp.; SikaTile 450 LHT Secure Set
2. Basis of Design: Texrite; Total Contact
3. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
4. Back butter all tile prior to installing tile on mortar bed.

B. Epoxy Thinset Mortar: ANSI A118.3, water cleanable; 100 percent solids epoxy thin-set mortar.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Ardex Americas.
b. Custom Building Products.
c. Laticrete International, Inc.
d. MAPEI Corporation; Kerapoxy 410
e. Texrite
f. Sika Corp.; SikaTile 825 Epoxy Mortar and Grout
2. Basis of Design: Texrite; Epoxyplus TS
3. Water cleanable epoxy thin-set with 2-hour cleaning time.100% solid epoxy resins and hardeners, with non-sag additive included in unit .
4. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 degrees F and 212 degrees F (60 degrees C and 100 degrees C), respectively, and certified by manufacturer for intended use.
5. Color number and name: Selected by Architect.

2.8 GROUT MATERIALS

A. Premixed Polymer Resin Grout:

1. Pre-mixed, high performance, flexible polymer, “ready to use”, stain resistant grout. Grout has maximum color uniformity with no cement, water or additives mixing with the grout. Grout contains acrylic flexible polymer based grout that resists bacteria, mold, fungus and stains. The flexible polymer grout will resist subtle movement, vibration, flexing and minor cracks over conventional cement based grouts. Grout not recommended for water submerged or constantly wet areas
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bostik, Inc.
   b. Custom Building Products.
   c. Laticrete International, Inc.
   d. MAPEI Corporation.; Flexcolor CQ
   e. Texrite
   f. Sika Corp.; SikaTile Ultima Grout
3. Basis of Design: Texrite, Chromaflex

B. Water-Cleanable Epoxy Grout: ANSI A118.3.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bostik, Inc.
   b. Custom Building Products.
   c. Laticrete International, Inc
   d. MAPEI Corporation; Kerapoxy CQ
   e. Texrite
   f. Sika Corp.; SikaTile 825 Epoxy Mortar & Grout
2. Basis of Design: Texrite; EpoxyPlus
3. Water cleanable grout with 2-hour cleaning time.100% solid epoxy resins and hardeners, with non-sag additive included in unit.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
1. Basis of Design: MAPEI Coproration; Mapecem Quickckpatch

B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Schluter Systems L.P.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Grout Sealer: Colorless, stain- and slip-resistant sealer, not affecting color or physical properties of stone surfaces grout as recommended by grout manufacturer for application indicated.
1. Basis of Design: Laticrete Stonetech

2.10 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants" and that do not stain stone.
1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D.
2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in stone adjoining sealed joints unless otherwise indicated.

C. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that concrete substrates for tile floors installed with thinset large and heavy tile mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
      a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
      b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
   3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
   4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset or large and heavy tile mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
   1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
      a. Tile floors in wet areas.
      b. Tile floors consisting of tiles 8 by 8 inches or larger.
      c. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
1. Wall tile joint maximum 1/8 inch (0.8 mm), adjust to smaller IF the floor calibration allows.
2. Floor tile joint maximum 3/16 inch (2.4 mm), adjust to smaller IF the wall calibration allows.
3. Align joints center to center.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, as required. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Joint Sealant: Color to match adjacent tile grout color.

J. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

K. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

L. Install expansion and control joints in accordance with TCA method EJ171.

3.4 TILE BACKING PANEL INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-Portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.7 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.8 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.9 TILE INSTALLATION SCHEDULE

A. Refer to Architect's Tile Installation drawings.

END OF SECTION 09 30 00

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
   1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
   2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Suspended ceiling components.
   2. Structural members to which suspension systems will be attached.
   3. Size and location of initial access modules for acoustical panels.
   4. Items penetrating finished ceiling including the following:
      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
   5. Perimeter moldings.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.9 WARRANTY

A. Slag-Resistant Ceiling Panels: Warrant products to be free from sagging, warping, shrinking, buckling, or delaminating as a result of manufacturing defects.
   1. Warranty Period: 15 years from date of Substantial Completion.

B. Standard Suspension System: Suspension systems shall be warranted to be free of defects in material or factory workmanship and shall not incur 50 percent red rust as defined by ASTM B117 test procedures.
   1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
   2. Smoke-Developed Index: 450 or less.

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations:
   1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
   2. Suspension System: Obtain each type from single source from single manufacturer.

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
   1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
   1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong World Industries, Inc.
2. CertainTeed Corp.
3. USG Interiors, Inc.; Subsidiary of USG Corporation.
4. Rockfon, LLC.

A. Basis-of-Design Product: Refer to Architect’s Master Schedule.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
a. Type: anchors.
b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.
d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.
2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

D. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

2.5 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong World Industries, Inc.
2. CertainTeed Corp.
3. USG Interiors, Inc.; Subsidiary of USG Corporation.
4. Rockfon, LLC.

B. Basis of Design: Refer to Architect’s Master Schedule.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong World Industries, Inc.
2. CertainTeed Corp.
3. Fry Reglet Corporation.
4. Gordon, Inc.
5. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Basis of Design: Refer to Architect’s Master Schedule.

C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
   1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
   2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
   3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

D. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
   1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
   2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.7 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, provide one of the following:
   1. Acoustical Sealant for Exposed and Concealed Joints:
      a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
      b. USG Corporation; SHEETROCK Acoustical Sealant.
   2. Acoustical Sealant for Concealed Joints:
      a. Pecora Corporation; AIS-919.
      b. Tremco, Inc.; Tremco Acoustical Sealant.

B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
   2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
   3. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
   1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
   7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   8. Do not attach hangers to steel deck tabs.
   9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
   11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure hanging wire for floating ceiling conditions so that wire is minumum 2 foot from edge of ceiling to conceal wires. Provide necessary support system to properly support grid from hanging wire to ceiling edge.

D. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
   2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
   3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

F. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

G. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
   1. Arrange directionally patterned acoustical panels as follows:
      a. As indicated on reflected ceiling plans.
   2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.

3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

SECTION 09 61 16 - CONCRETE FLOOR SEALING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Sealing of concrete floor areas not otherwise scheduled to receive finish floor covering.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Include data to indicate chemical, solvent, and detergent resistance.
   2. Include information for primer, sealants, accessories and other required components.

1.4 CLOSOUT SUBMITTALS

A. Maintenance Data: For fluid-applied floor sealer to include in maintenance manuals. Include the following:
   1. Manufacturer’s instructions on maintenance renewal of applied treatments.
   2. Protocols and product specifications for joint filing, crack repair and/or surface repair.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this Section with minimum 10 years documented experience.

B. Installer Qualifications: An installer (applicator) who is approved, trained, or certified by fluid-applied floor sealer manufacturer.

C. Source Limitations: Furnish products from one manufacturer for entire Project, unless otherwise acceptable to Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manner to prevent damage to containers and bags.

B. Store materials in accordance with manufacturer's instructions in clean and dry location with temperature between 60 deg F and 90 deg F.

C. Keep products away from fire or open flame.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with flooring manufacturer's written instructions for substrate temperature, ambient temperature, humidity, ventilation, and other conditions affecting flooring application.
   1. Do not apply flooring until spaces are enclosed and weatherproof; wet work in spaces is complete and dry; and overhead work, including installing mechanical systems, lighting, and athletic equipment, is complete.

B. Conditioning Period: Begins not less than 7 days before flooring application, is continuous through application, and continues not less than 3 days after application.
   1. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.

C. Ventilate area where flooring is being installed. Post and enforce no smoking and no open flame signs until flooring has cured.

D. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during floor sealer application.

E. Close spaces to traffic during floor sealer application and for not less than 24 hours after application unless manufacturer recommends a longer period.

1.8 WARRANTY

A. Provide written warranty signed by manufacturer warranting work to be free from defective materials and workmanship, and agreeing to replace components which fail within 2 years from date of Substantial Completion.
   1. Failed materials and workmanship includes spalling, cracking, and delamination.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Dayton Superior Specialty Chemical Corp.
   2. L & M Construction Chemicals, Inc.
   3. Euclid Chemical.
   4. Prosoco
   5. MAPEI Corporation

A. Basis of Design: Refer to Architect’s Master Schedule.

2.2 ACCESSORIES

A. Joint Sealant Materials: Manufacturer's recommended sealant compatible with flooring system for type of service and joint condition indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer (Applicator) present, for conditions affecting performance of flooring including substrate moisture content.

B. Examine areas to receive flooring for:
   1. Defects in substrate that may affect proper execution of flooring work.
   2. Deviations beyond allowable tolerance for concrete slab work.
   3. Surface curing agents or sealers that would inhibit bond.
   4. Surface defects such as cracks that could transfer through to finished flooring surface if not corrected.

C. Do not begin flooring work until concrete has cured a minimum of 28 days.

D. Do not begin work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare Substrate: Tests concrete substrate for pH, contaminants, and moisture content in accordance with manufacturer’s recommendations. Ensure concrete is within manufacturers recommended limits prior to installation.

B. Concrete Sub-floors: Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond.
   2. Prepare concrete flooring per manufacturer’s recommendation to remove inappropriate curing agents and to open pores of concrete surfaces to allow penetration of bonding agent. Completely remove cleaning residue.
   3. Repair cracks, divots and surface imperfections according to manufacturer's instructions.
   4. Vacuum to remove dust and debris.

C. Protect walls, floor openings, equipment, electrical openings, door frames, and other obstructions during installation. Cover floor and wall areas at mixing stations.

3.3 APPLICATION

A. General: Mix and apply flooring components according to manufacturer's written instructions.

B. Apply a minimum of 2 coats in accordance with manufacturer’s recommended coverage rates.

3.4 CURING

A. Cure flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process.

3.5 CLEANING AND PROTECTION

A. Clean as recommended by manufacturer. Do not use materials or methods which may damage surface or surrounding construction.
   1. Cleaner, Maximum VOC Content: In accordance with applicable codes.

B. Remove temporary covering and clean flooring prior to final inspection. Use cleaning materials and procedures recommended by flooring manufacturer.

C. Protect finished work.

D. Do not permit traffic over finished flooring surfaces.

E. Protect flooring materials from damage and wear during construction operation.

END OF SECTION 09 61 16

SECTION 09 64 10 - WOOD STAGE FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood strip and Masonite flooring mechanically applied installed over plywood base.

1.2 SUBMITTALS

A. Product Data:
   1. Submit product data for each product.
   2. Include color charts for finish indicating manufacturer's standard colors available for selection.
   3. Include information for adhesives, fasteners, accessories and other required components.

B. Shop Drawings:
   4. Provide layout including dimensions, expansion joints, and pattern.
   5. Submit detail drawings of wood flooring pattern.
   6. Submit drawings showing field measured dimensions.

C. Samples:
   7. Submit sample 12 inches long by width by thickness; illustrating color and texture variation of each wood species and finish.

D. Closeout Submittals:
   8. Maintenance data.
   9. Warranty: Submit specified warranty.

1.3 QUALITY ASSURANCE

A. Single Source Responsibility: Furnish wood flooring from one manufacturer for entire Project, unless otherwise acceptable to Architect.

B. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this Section with minimum 5 years documented experience.

C. Installer Qualifications:
   1. Acceptable to manufacturer with documented experience on at least 5 projects of similar nature in past 5 years.
   2. Specialized wood flooring firm.

D. Certifications:
   3. Submit manufacturer's certification that products furnished for Project meet or exceed specified requirements.
   4. Submit Contractor's and installer's certification that products are installed in accordance with Contract Documents.

1.4 MOCKUPS

A. Mockup Installation:
   1. Construct mockup measuring 10 feet by 10 feet.
   2. Show color variations, and attachment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect materials from damage, moisture, soiling and deterioration during transit and storage.

B. Do not deliver wood flooring materials until Project site conditions and operations which could damage, soil or deteriorate work are complete.

C. Store products and materials in ventilated, interior locations under constant minimum temperature and relative humidity recommended by wood flooring manufacturer.

1.6 PROJECT CONDITIONS

A. Environmental Requirements: Obtain and maintain temperature and moisture conditions as recommended by wood flooring manufacturer during installation and remainder of construction period.

B. Field Measurements:
   1. Field measure conditions where wood flooring is indicated to be fitted to other construction prior to fabricating work of this Section.
   2. Show final field measurements on shop drawings.
   3. Where field measurements cannot be made without delaying Project, coordinate dimensions among trades to ensure proper fit of wood flooring.

1.7 WARRANTY

A. Warrant wood flooring to be free from defects in material and workmanship for 3 years.

B. Coverage to include but not limited to:
   1. Buckling, warping, squeaking, and loosening.
   2. Excessive open joints and cracks.
   3. Deterioration of finishes beyond normal wear.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

C. Design Requirements:
   1. Provide concealed fastening wherever possible.
   2. Attachment considerations shall take into account site peculiarities and expansion and contraction movements so there is not possibility of loosening, weakening, buckling, or fracturing connection between wood flooring and substrate.

2.2 WOOD STAGE FLOORING

A. Plywood Subflooring: DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness not less than 3/4-inches.

B. Finish Flooring: MDF: ANSI A208.2, Grade 130.
   1. Approved Product: Medite FR Fire-Rated MDF.
   2. Thickness: 1/4-inches

C. Floor Finish: As indicated on Architect’s Master Schedule.

2.3 ACCESSORIES

A. Wood Reducer Strip: Species, grade, and finish to match wood flooring.

B. Threshold: Species, grade, and finish to match wood flooring.

C. Wood Trim: Species, grade, and finish to match wood flooring.

D. Fasteners: Staples of type, size, and finish recommended by flooring manufacturer.

E. Vapor Retarder:
   1. 6.0 mil polyethylene sheet, conforming to ASTM D4397.
   2. Asphalt-saturated felt, ASTM D226, Type I, No. 15.

2.4 FABRICATION

A. General: Prior to fabrication, field measure actual existing conditions to ensure proper fit.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates comply with manufacturer's requirements.

B. Ensure concrete has cured 28 days minimum.

C. Verify concrete curing compounds are compatible with flooring adhesive.

D. Verify that substrate is clean, dry, free of voids and cracks.

E. Verify vapor retarder was placed below slab-on-grade.

3.2 PREPARATION

A. Check levelness of concrete substrate to ensure not more than 1/4 inch deviation in any direction when checked with 10 foot straight edge. Grind down high spots or fill in low spots to correct improper conditions.

3.3 WOOD FLOORING INSTALLATION

A. Install in accordance with manufacturer's printed instructions and approved shop drawings.

B. Install wood flooring and Masonite level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with surrounding construction.

C. Vapor Retarder:
1. Polyethylene film, loose laid on slab.
2. Overlap edges 6 inches and extend under baseboard at partitions.

D. Underlayment:
3. Provide 4-feet by 8-feet plywood underlayment installed over vapor retarder.
4. Lower Layer:
a) Stagger joints 16-inches each row, with 1/8-inch gaps.
b) Secure 16-inches on center with #8 by 1/2-inch decking screws countersunk flush
5. Upper Layer:
a) Stagger joints 9-inches each row both way from previous layer.
b) Secure 12-inches on center with #8 by 1/2-inch decking screws countersunk flush.

B. Finish Flooring:
1. Offset and stagger joint 10-inches both way in alternate direction from previous later.
2. Provide two-layers of finish flooring.
3. Secure 12-inches on center with #8 by 1-inch black decking screws countersunk flush.

3.4 CLEANING

A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish and surrounding construction.

3.5 PROTECTION

A. Protect finished wood flooring.

END OF SECTION

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Resilient base.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Furnish not less than 10 linear feetfor every 500 linear feetor fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg For more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Burke Mercer Flooring Products, Division of Burke Industries Inc.
2. Flexco.
3. Roppe Corporation, USA.
4. Tarkett.

B. Basis of Design: Refer to Architect’s Master Schedule.

C. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

D. Thickness: As indicated in Architect's Master Schedule.

E. Height: As indicated in Architect's Master Schedule.

F. Lengths: Coils in in maximum lengths available to minimize the numbers of joints.

G. Outside Corners: Preformed

H. Inside Corners: Preformed.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Do not install resilient products until they are the same temperature as the space where they are to be installed.
1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

C. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum horizontal surfaces thoroughly.
   3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 09 65 13

SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. LVT, Solid vinyl floor tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   1. Show details of special patterns.

C. Samples for Verification: Full-size units of each color and pattern of floor tile required.

D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor Tile: Two percent of each type, color, and pattern of floor tile installed or two unopened containers, whichever is greater.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups for floor tile including resilient base and accessories.
      a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.10 WARRANTY

A. Special Warranty for Solid Vinyl Tiles: Manufacturer agrees to repair or replace components of vinyl tile installation that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 20 years from date of Substantial Completion with no finish requirements to maintain warranty.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LVT, VINYL FLOORING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Mohawk with M-Force Finish.
   2. Patcraft with ExoGuard Finish.
   3. Tarkett with Techtonic Finish.

B. Basis of Design: Refer to Architect’s Master Schedule

C. Solid Vinyl Tile: Meeting ASTM F 1700, ASTM E 662, ASTM D 2047.
   1. Class: As indicated by product designations.
   2. Type: As indicated by product designations.
   3. Thickness: 3 mm minimum, or as indicated on Master Schedule.
   4. Wear Layer: 20 mil minimum enhanced urethane wear layer.
   5. Adhesive: Slip Resistance: Greater than 0.60

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
   1. Provide adhesive that can function at a minimum of concrete relative humidity of 98 percent.
   2. Moisture Level Resistance: ASTM F2170.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
   4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
      a. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
   1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
   1. Lay tiles in pattern indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
   1. Lay tiles in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 68 13 - CARPET TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes modular, carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
      a. Review delivery, storage, and handling procedures.
      b. Review ambient conditions and ventilation procedures.
      c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:
   1. Floor Plan showing overall layout including: columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
   2. Carpet tile type, color, and dye lot.
   3. Pattern of installation.
   4. Pile direction.
   5. Type, color, and location of insets and borders.
   6. Type, color, and location of edge, transition, and other accessory strips.
   7. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet Tile: Full-size Sample.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
   1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.8 QUALITY ASSURANCE

A. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockups at locations and in sizes shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.10 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
   1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
   3. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Products: Subject to compliance with requirements, provide one of the following:
   1. Tarkett.

B. Basis of Design Product: Refer to Architect’s Master Schedule.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
   1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
4. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
5. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
   a. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.
   b. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
   2. Remove yarns that protrude from carpet tile surface.
   3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 81 16 - ACOUSTICAL BLANKET INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Concealed building acoustical insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Glass-Fiber Insulation:
a. CertainTeed Corporation.
b. Cameron Ashely Building Products. .
c. Johns Manville.
d. Knauf Insulation.
e. Owens Corning.
2. Basis of Design: Knauf Insulation; EcoBatt with ECOSE

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.
1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Unfaced, Flexible Glass-Fiber Board Insulation (in walls and above ceilings): ASTM C 665, Type I; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; and of the following properties:
1. Combustion Characteristics: Passes ASTM E 136.

C. Thickness: As indicated on the Architect’s Partition Type sheet.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

F. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Install blankets in cavities formed by framing members according to the following requirements:
   1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
   2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

3.5 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 09 81 16

SECTION 09 84 33 - SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes shop-fabricated, acoustical panel units tested for acoustical performance, including the following:
   1. Sound-absorbing wall panels.

1.2 DEFINITIONS

A. SAA: Sound Absorption Average.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For unit assembly and installation.
   1. Include plans, elevations, sections, and mounting devices and details.
   2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
   3. Include details at cutouts and penetrations for other work.
   4. Include direction of fabric weave and pattern matching.

C. Samples for Verification: For the following products:
   1. Assembled Panels: Approximately 36 by 36 inches, including joints and mounting methods.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Electrical outlets, switches, and thermostats.
   2. Items penetrating or covered by units including the following:
      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Alarms.
      e. Sprinklers.
      f. Access panels.
   3. Show operation of hinged and sliding components covered by or adjacent to units.

B. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal instructions.

1.6 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
   1. Build mockup of typical wall area as shown on Drawings. Include intersection of wall and ceiling, corners, and perimeters.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install units until a permanent level of lighting is provided on surfaces to receive the units.

C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to the following:
      a. Acoustical performance.
      b. Fabric sagging, distorting, or releasing from panel edge.
      c. Warping of core.
   2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.
   2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.2 SOUND-ABSORBING WALL UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Armstrong.
   2. MBI Products Company.
   3. Sound Concepts.

B. Basis of Design: Refer to Architect’s Master Scheule.

C. Felt Panels:
   1. Description: 100 percent wool design felt.
   2. Substrate: Manufacturer’s standard acoustic.
   3. Thickness: 9 mm.
   4. Panel Height and Width: As indicated on Drawings.
   5. Color: As indicated on Architect’s Master Schedule.
   6. Mounting: Manufacturer’s standard interlock mounting system.
   7. Acoustical Performance: Sound absorption NRC of not less than .075 according to ASTM C423.

2.3 MATERIALS

A. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit.

2.4 FABRICATION

A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.

B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
   1. Thickness.
   2. Edge straightness.
   3. Overall length and width.
   4. Squareness from corner to corner.
   5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabric, fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb and Level: Plus or minus 1/16 inch in 48 inches, noncumulative.

B. Variation of Joint Width: Not more than 1/16-inch variation from hairline in 48 inches, noncumulative.

3.4 CLEANING

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION

SECTION 09 84 36 - SOUND-ABSORBING CEILING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes shop-fabricated, acoustical panel units tested for acoustical performance, including the following:
   1. Sound-diffusing ceiling panels.

1.3 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

B. SAA: Sound Absorption Average.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include panel edge, core material, and mounting indicated.

B. Shop Drawings: For unit assembly and installation.
   1. Include reflected ceiling plans, elevations, sections, and mounting devices and details.
   2. Include details at joints and corners; and details at ceiling intersections and intersections with walls. Indicate panel edge profile and core materials.
   3. Include direction of fabric weave and pattern matching.

C. Samples for Verification: For the following products:
   1. Assembled Panels: Approximately 12 by 12 inches, including joints and mounting methods.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Electrical outlets.
   2. Suspended ceiling components above ceiling units.
   3. Structural members to which suspension devices will be attached.
   4. Items penetrating or covered by units including the following:
      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Alarms.
      e. Sprinklers.
      f. Access panels.

B. Product Certificates: For each type of unit.

C. Sample Warranty: For manufacturer's special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturer's written cleaning and stain-removal instructions.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install units until a permanent level of lighting is provided on surfaces to receive the units.

C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Acoustical performance.
      b. Fabric sagging, distorting, or releasing from panel edge.
      c. Warping of core.
   2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain ceiling units specified in this Section **"** from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.
   2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

2.3 SOUND-DIFFUSING CEILING UNITS

A. Sound-Diffusing Ceiling Panel: Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back edge border of core.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Armstrong.
      b. MBI Products Company.
      c. Sound Concepts.
   2. Basis of Design: Refer to Architect’s Master Scheule.

B. Panel Shape: Pyramidal.

C. Mounting: Back mounted with manufacturer's standard suspension system, secured to substrate.

D. Core: Manufacturer's standard, prepared for required acoustical performance.

E. Acoustical Performance: Sound absorption NRC of 0.10 according to ASTM C423 for Type A mounting according to ASTM E795.

F. Panel Width: As indicated on Drawings.

G. Panel Height: As indicated on Drawings.

2.4 FABRICATION

A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated, with facing material applied to face, edges, and back border of dimensionally stable core and with rigid edges to reinforce panel perimeter against warpage and damage.

B. Measure each area and establish layout of panels and joints of sizes indicated on Drawings within a given area.

C. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.
5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabric, fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units in locations indicated. Unless otherwise indicated, install units with edges in alignment with walls and other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

C. Align fabric pattern and grain with adjacent units.

3.3 INSTALLATION TOLERANCES

A. Variation from Alignment with Surfaces: Plus or minus 1/16 inch in 48 inches, noncumulative.

B. Variation from Level or Slope: Plus or minus 1/16 inch.

C. Variation of Joint Width: Not more than 1/16 inch wide from hairline in 48 inches, noncumulative.

3.4 CLEANING

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 09 84 36

SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents: General and Supplementary Conditions of the Contract, Division 01 General Requirements, and Drawings are applicable to this Section.

B. Section Includes:
1. Complete surface preparation and finishing for field application of coatings and requirements for field finishing mechanical and electrical equipment.
2. Examine specifications for various other trades and their provisions regarding their painting. Surfaces that are left unfinished by other sections of the specifications shall be painted or finished as a part of this Section.
3. Colors, including deep tones, will be selected by the Architect. Number of colors to be used on job will be determined by Architect.

1.2 SURFACES NOT TO RECEIVE FIELD FINISHING

A. Do not paint copper, bronze, chrome plated items, nickel, stainless steel, Monel metal, lead, face brick, prefinished wall, ceiling, and floor coverings, items with factory applied final finish (except where exposed on roofs and in finished spaces), elevator shafts, crawl spaces, chases, and plenums above suspended ceilings unless otherwise specified or scheduled.

1.3 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.4 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with 3 years experience.

B. Applicator: Company specializing in commercial painting and finishing with 2 years experience.

C. Product Labels: Include manufacturer's name, type of paint, stock number, color and label analysis on label of containers.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable building code for flame spread/fuel contribution/smoke development rating requirements for finishes.

B. Comply with applicable city, county, state, and federal requirements and ordinances regarding maximum VOC (Volatile Organic Compound) content of all coatings.

1.6 TESTS

A. Provide periodic testing with Wet Film Thickness gage to verify that proper thickness of finish coatings are being applied.

1.7 SUBMITTALS

A. Provide product data describing physical performance criteria and composition on all finishing products.

B. Samples, 12 by 12 inches in size illustrating range of colors and textures selected for each surface finishing product scheduled.

1.8 MOCKUP PANELS

A. Provide field sample panel, 96 inches long by 96 inches wide, illustrating each coating color, texture, and finish intended for use.

B. Locate where directed.

C. Accepted sample may remain as part of the Work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and protect products under provisions of Division 1 section “Product Requirements”

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.

C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside the ranges required by paint manufacturer.

B. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

C. Do not apply exterior coatings during rain or snow, or when relative humidity is above 75 percent, unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Varnish and Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

F. Provide lighting level of 80 ft candles measured mid- height at substrate surface.

1.11 EXTRA STOCK

A. Provide a 5 gallon container of each color to Owner.

B. Label each container with color, color number, texture, and room locations, in addition to the manufacturer's label.

1.12 SCAFFOLDS AND PROTECTION

A. Provide adequate safe ladders, scaffolds, and stages necessary to complete work.

B. Protect completed finish and paint work, and protect adjacent finish surfaces from paint splatter, spills and stains. Use adequate drop cloths and masking procedures during progress of work.

1.13 PRECAUTIONS

A. Do not store paints, oils, thinners and other flammable items inside the building and shall be stored in approved containers when not in actual use during the painting job. The fire hazard shall be kept at a minimum.

B. Precaution shall be taken to protect the public and construction workers during the progress of the work.

C. Furnish a temporary fire extinguisher of suitable chemicals and capacity, located near flammable materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements indicated, provide products of one of the following:
1. Benjamin Moore.
2. Pittsburgh Paints Company.
3. Sherwin-Williams.

B. Materials selected for coating systems for each type surface shall be product of a single manufacturer unless otherwise specified. Secondary products such as linseed oil, turpentine and shellacs shall be first quality products of a reputable manufacturer.

2.2 MATERIALS

A. Coatings: Ready mixed. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating with good flow and brushing properties; capable of drying or curing free of streaks or sags.

B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

C. Patching Materials: Latex filler.

2.3 FINISHES

A. Color and Sheen: As indicated on Architect's Master Schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and substrate conditions are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report to Architect any condition that may potentially affect proper application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums
1. Plaster and Gypsum Wallboard: 12 percent.
2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
3. Interior Located Wood: 15 percent, measured in accordance with ASTM D2016.
4. Exterior Located Wood: 15 percent, measured in accordance with ASTM D2016.
5. Concrete Floors: 8 percent.

D. Test shop applied primers for compatibility with subsequent cover materials.

E. Beginning of installation means acceptance of existing surfaces and substrate.

3.2 PREPARATION

A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.

B. Correct minor defects and clean surfaces which affect work of this Section. Remove existing coatings which exhibit loose surface defects.

C. Shellac and seal marks which may bleed through surface finishes.

D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

F. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

G. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid- alkali balance is achieved. Allow to dry.

H. Gypsum Board Surfaces: Latex fill minor defects. Spot prime defects after repair.

I. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

J. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

K. Uncoated Steel and Iron Surfaces: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

L. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

M. Aluminum with Alodine Finish: Clean by lightly scuff with sandpaper. Remove all dust.

N. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

O. Interior Wood Items Schedule to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.

P. Shop Finished Items: Finish in accordance with AWI standards and guide lines.

Q. Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.3 SURFACE PREPARATION OF PREVIOUSLY COATED SURFACES

A. General:
1. Remove cracked and deteriorated sealants and calking.
2. Remove chalk deposits and loose, blistered, peeling, scaling, or crazed finish to bare base material or sound substrate by scraping and sanding.
3. Wash surfaces with solution of TSP to remove wax, oil, grease, and other foreign material; rinse, and allow to dry. Exercise caution that TSP solution does not soften existing coating.
4. Abrade glossy surfaces by sanding or wiping with liquid de-glosser.
5. Remove mildew as specified above.
6. Test compatibility of existing coatings by applying new coating to small, inconspicuous area. If new coatings lift or blister existing coatings, request recommendation from Architect.
7. Apply specified primer to surfaces scheduled to receive coatings.

B. Gypsum Wallboard:
1. Fill cracks and voids with spackling compound.
2. Apply primer over bare surfaces and newly applied texture coatings.

C. Metal:
1. Remove rust from surfaces to bare metal in accordance with SP3 "Power Tool Cleaning".
2. Exercise care not to remove galvanizing.
3. Complete preparation as specified for new work.

D. Wood:
1. Fill cracks, crevices and nail holes with putty or wood filler.
2. Apply primer over bare surfaces and filler material.

3.4 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site.

3.5 APPLICATION

A. The intent of these Specifications is to produce the highest quality appearance of paint and finish surfaces. Employ skilled mechanics only. The proper preparation of all surfaces will be strictly enforced and wherever finished surfaces show any defects due to improper preparation, workmanship, etc., the defects shall be removed and the work refinished at the expense of the Contractor.

B. Apply products in accordance with manufacturer's instructions. Final finish coats shall have visual evidence of solid hiding and uniform appearance, and shall be free and smooth of brush marks, streaks, sags, runs, laps, or skipped areas.

C. Do not apply finishes to surfaces that are not dry.

D. Apply each coat to uniform finish and thickness.

E. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

F. Sand lightly between coats on wood and metal items to achieve required finish.

G. Allow applied coat to dry before next coat is applied.

H. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Prime back surfaces of interior and exterior woodwork scheduled to be painted with primer paint.

J. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

K. Edges of paint adjoining other materials or colors shall be sharp and clean with no overlapping.

3.6 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint all shop primed equipment. Paint shop prefinished items where exposed to view in finished spaces. In mechanical rooms, repair shop pre-finished coatings which have been scratched or otherwise damaged with identical touch-up paint. Sand prior to touching up as required.

B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

C. Paint all grilles, registers, diffusers, and speaker grilles to match adjacent wall and ceiling surfaces, except that factory pre-finished items need not be painted if installed in a suspended acoustical ceiling system where the acoustical panels match the mechanical or electrical item color.

D. In all finished spaces, prime and paint exposed pipes, conduit, boxes, ducts, hangers, brackets, collars and supports. Paint to match adjacent surfaces.

E. Repair or replace identification markings on mechanical or electrical equipment when painted accidentally.

F. Paint interior surfaces of air ducts and convectors that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles, and convector to match face panels.

G. Paint all surfaces of plywood backboards for electrical and telephone equipment before installing equipment.

H. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

I. Paint exposed air handlers, roof ventilators, goose necks, exhaust fans and other items on the roof with 2 coats exterior enamel. Prepare surfaces in accordance with the base metal or primer as specified herein.

J. Paint concrete support bases with gray floor deck enamel.

K. Pipe hangers and other supports need not be painted except where installed in crawl spaces, where they shall be painted with a thick coat of asphaltic paint.

3.7 CLEANING/TOUCH-UP

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

D. Spot painting will be allowed to correct soiled or damaged paint surfaces only when touch-up spot will blend into surrounding finish and is invisible to normal viewing (as determined by the Architect). Otherwise, re-coat entire section to corners or to a visible stopping point.

3.8 V.O.C. (VOLATILE ORGANIC COMPOUND) COMPLIANCE

A. Products listed in following schedule and/or substitutes proposed for use by Contractor must be formulated to meet all applicable ordinances and regulations regarding maximum V.O.C. content. Utilize products which have been specially formulated to need such requirements.

3.9 INTERIOR PAINT SCHEDULE

A. Drywall (Gypsum):
1. Latex:
a. Benjamin Moore:
1) Primer: UltraSpec 500 Zero VOC Latex Primer.
2) Finish Coats: UltraSpec 500 Zero VOC Interior.
b. Pittsburgh Paints Company:
1) Primer: One coat Speedhide latex 6-2 primer
2) Finish Coats: Two coats Speedhide zero VOC latex
c. Sherwin-Williams:
1) Primer: One coat ProMar 200 Zero VOC Interior Latex Primer, B28W2600
2) Finish Coats: Two coats ProMar 200 Zero VOC

B. Drywall (Gypsum - High Traffic Corridors, Stairwells)
a. Benjamin Moore:
1) Primer: One coat HB-2100 Inslx High Build Primer.
2) Finish Coats: Two Coats Pre-Catalyzed WB Primer.
b. Pittsburgh Paints Company:
1) Primer: One coat Speedhide Interior Latex Primer 6-2.
2) Finish Coats: Two coats Pitt-Glaze WB1 Pre-Catalyzed Waterborne Epoxy.
c. Sherwin-Williams:
1) Primer: One coat High Build Latex Primer B28W8601
2) Finish Coats: Two coats Pro Industrial Pre-Catalyzed Waterbased Epoxy.

C. Drywall (Gypsum – Wet Locations)
1. Epoxy
a. Pittsburgh Paints Company:
1) Primer: One coat Speedhide Interior Latex Primer 6-2.
2) Finish Coats: Aquapon WB EP Water-Based Epoxy 98E-1.
b. Sherwin-Williams:
1) Primer: One coat ProMar 200 Zero VOC Latex Primer, B28W02600
2) Finish Coats: Two coats Pro Industrial Water Based Catalyzed Epoxy B73 series.

D. CMU, Concrete Block:
1. Latex:
a. Benjamin Moore:
1) Primer: 571 Block Filler.
2) Finish Coats: Two coats HP Pre Cat Epoxy V342
b. Pittsburgh Paints Company:
1) Primer: 1 coat Speedhide Int/Ext Masonry hi fill latex Block filler 6-15
2) Finish Coats: Two coats Speedhide zero VOC latex.
c. Sherwin-Williams:
1) Primer: One coat PrepRite Block Filler B25W25
2) Finish Coats: Two coats ProMar 200 Zero VOC.

E. CMU, Concrete Block (Wet Areas):
1. High Performance Coating, Water-Based Epoxy:
a. Benjamin Moore:
1) Primer: One 571 Block Filler
2) Finish Coats: Two coats HP Pre Cat Epoxy V342
b. Pittsburgh Paints Company:
1) Primer: Primer: One coat Speedhide Int/Ext Masonary hi fill latex Block filler 6-15XI.
2) Finish Coats: Two coats Pitt-Glaze WB1 16-1510
c. Sherwin-Williams:
1) Primer: One coat Kem Cati Coat primer
2) Finish Coats: Two coats Pro Industrial Waterbased Catalyzed Epoxy.

F. Wood Paneling, Trim, Doors, Cabinets:
1. Latex:
a. Benjamin Moore:
1) Primer: One Coat of Fast Sanding Primer 507
2) Finish Coats: Two Coats of Door Trim and Cabinet
b. Pittsburgh Paints Company:
1) Primer: One coat Speedhide latex sealer 6-2 primer
2) Finish Coats: Two coats Speedhide zero VOC latex
c. Sherwin-Williams:
1) Primer: One coat Premium Wall and Wood Primer B28W08111
2) Finish Coats: Two coats ProClassic Interior Waterbased Acrylic-Alkyd B34W00853

G. Galvanized Metal:
1. High Performance Coating, Water Based Acrylic
a. Benjamin Moore:
1) Primer: One coat of Ultra Spec Metal Primer HP04.
2) Finish Coats: Two coats of HP DTM Acrylic.
b. Pittsburgh Paints Company:
1) Primer: One coat Pitt-Tech Plus Direct-to-Metal 4020 PF primer.
2) Finish Coats: Two coat Pitt-Tech Plus EP 90-1610.
c. Sherwin-Williams:
1) Primer: One coat Pro Industrial Pro-Cryl Universal Acrylic Primer.
2) Finish Coats: Two coats Pro Industrial Acrylic Coating.

H. Shop Primed Metal Doors:
1. High Performance Coating, Urethane: (rust inhibitive, UV stable)
a. Benjamin Moore:
1) Primer: One Coat of HP04 Acrylic Metal Primer
2) Finish Coats: Two coats of Super Spec Urethane Alkyd
b. Pittsburgh Paints Company:
1) Finish Coats: Gloss: Aquapon WB 98E-1.
c. Sherwin-Williams:
1) Primer: One coat Recoatable Epoxy Primer 67A5
2) Finish Coats: Two coats Acrolon 218 HS Polyurethane B65W611

I. Shop Primed Ferrous Metal, Trim, Panels and Miscellaneous Surfaces:
1. High Performance Coating, Water-Based Acrylic:
a. Benjamin Moore:
1) Finish Coats: 2 coats of High Performance WB DTM.
b. Pittsburgh Paints Company:
1) Finish Coats: Two topcoats Pitt-Tech Plus EP 90-1710.
c. Sherwin-Williams:
1) Finish Coats: Two coats Pro Industrial Acrylic Coating B66-650 Series.

J. Handrails, Stairs, and Guardrails:
1. High Performance Coating, Epoxy:
a. Benjamin Moore:
1) Primer: One coat of V150 Polyamide Epoxy Primer
2) Finish Coats: Two coats of V400 Polyamide Epoxy Coating
b. Pittsburgh Paints Company:
1) Finish Coats: Two topcoats Aquapon WBEP 98E-1.
c. Sherwin-Williams:

1) Primer: One coat Waterbased Pro Industrial Pro-Cryl Primer B66W310
2) Finish Coats: Two coats Pro Industrial Waterbased Catalyzed Epoxy.

2. High Performance Coating, Water-Based Acrylic:
   a. Benjmain Moore:
      1) Primer: One coat Corotech Acrylic Metal Primer
      2) Finish Coats: Two coats Corotech Acrylic DTM Enamel
   b. Pittsburgh Paints Company:
      1) Primer: One coat Pitt-Tech Direct-to-Metal 4020PF primer
      2) Finish Coats: Two coats Pitt-Tech Plus EP 90-1610 topcoat.
   c. Sherwin-Williams:
      1) Primer: One coat Pro Industrial Pro-Cryl Primer B66W310
      2) Finish Coats: Two coats Pro Industrial Acrylic Coating.

K. Flooring, Steps, and Catwalks:
1. High Performance Coating, Water-Based Epoxy:
   a. Benjamin Moore:
      1) Primer: One coat Corotech Acrylic Metal Primer V110
      2) Finish Coats: Two coats Coronado Super Kote 5000 Dry Fall Latex.
   b. Pittsburgh Paints Company:
      1) Primer: Pitt Tech Plus 4020 PF Interior/Exterior Primer/Finish, 4020PF
      2) Finish Coats: Pitt-Glaze WB1 Pre-Catalyzed Acrylic Epoxy.
   c. Sherwin-Williams:
      1) Primer: One coat Pro Industrial Pro-Cryl Primer B66-1300 Series.
      2) Finish Coats: Two coats Pre-Catalyzed Water Based Epoxy.

L. Machinery, Equipment and Fixtures (Shop Primed):
1. High Performance Coating, Water-Based Acrylic:
   a. Benjamin Moore:
      1) Finish Coats: Two coats of High Performance DTM
   b. Pittsburgh Paints Company:
      1) Finish Coats: Two topcoats Pitt-Tech Plus EP 90-1610 over prepared substrate.
   c. Sherwin-Williams:
      1) Finish Coats: Two coats Zero VOC Acrylic over prepared substrate.

M. Decking (Ferrous Unprimed), Bar Joists (Unprimed):
1. Water-Based Acrylic Dry Fall:
   a. Benjamin Moore:
      1) Primer: One coat of Water based Multi Purpose Primer 067.
      2) Finish Coats: Two coats of Latex Dryfall 397.
   b. Pittsburgh Paints Company:
      1) Primer: One coat Pitt-Tech 4020 primer
      2) Finish Coats: Two coats Speedhide Super Tech Dry Fall 6-725.
   c. Sherwin-Williams:
      1) Primer: One coat Pro-Cryl Universal Primer B66-310 Series
      2) Finish Coats: Two coats Low VOC Waterborne Acrylic Dryfall B42W81.

N. Decking (Pre-primed/Prefinished), Bar Joists (Shop Primed):
1. Water-Based Acrylic Dry Fall:
   a. Benjamin Moore:
      1) Finish Coats: Two coats of Latex Dryfall 397
   b. Pittsburgh Paints Company:
      1) Finish Coats: Two topcoats Speedhide Super Tech Dry Fall 6-725 series over prepared substrate.
   c. Sherwin-Williams:
      1) Finish Coats: Two coats Low VOC Waterborne Acrylic Dryfall over Prepared substrate.

O. Decking (Galvanized):
1. Water-Based Acrylic Dry Fall:
   a. Benjamin Moore:
      1) Finish Coats: Two coats of Latex Dryfall 397
   b. Pittsburgh Paints Company:
      1) Finish Coats: Two topcoats Speedhide Super Tech Dry Fall 6-725 series over prepared substrate.
   c. Sherwin-Williams:

1) Finish Coats: Two coats Low VOC Waterborne Acrylic Dryfall Flat B42W81 over prepared substrate.

3.10 EXTERIOR PAINT SCHEDULE

A. CMU, Cinder Block, Split Face Block:
1. 100 Percent Acrylic Latex:
a. Benjamin Moore:
1) Primer: One coat of Ultra Spec Masonry High Build Interior/Exterior 100% Acrylic Sealer 609
2) Finish Coats: Two Coats of Ultra Spec Ext
b. Pittsburgh Paints Company:
1) Primer: One coat Speedhide Block Filler primer 6-15XI
2) Finish Coats: 2 coats Speedhide 100% Acrylic topcoat
c. Sherwin-Williams:
1) Primer: One coat PrepRite Block Filler B25W25
2) Finish Coats: Two coats A-100 Series topcoat.
2. Latex High Build Texture Coating:
a. Benjamin Moore:
1) Primer: One coat of high build block filler
2) Finish Coats: Two coats of Coronado TexCrete Waterproofer.
b. Pittsburgh Paints Company:
1) Primer: One coat Speedhide Block Filler primer 6-15XI,
2) Smooth Coat: Two coats Textured Coatings 4-50 topcoat.
3) Medium Coat: Two coats Textured Coatings 4-60 topcoat.
c. Sherwin-Williams:
1) Primer: One coat PrepRite Block Filler B25W25.
2) Fine Coat: Two coats UltraCrete A44W801 topcoat.
3) Medium Coat: Two coats of UltraCrete A44W811 topcoat.
4) Extra Coarse Coat: Two coats of UltraCrete A44W821 topcoat.
3. Elastomeric:
a. Benjamin Moore:
1) Primer: One coat of Ultra Spec Masonry High Build Interior/Exterior 100% Acrylic Sealer 609.
2) Finish Coats: Two coats of Ultra Spec Masonry Elastomeric Waterproofing Coating.
b. Pittsburgh Paints Company:
1) Primer: One coat Block Filler 6-15XI primer.
2) Smooth Coat: Two coats Perma-Crete Pitt-Flex 4-110XI topcoat.
c. Sherwin-Williams:
1) Primer: One coat PrepRite Block Filler B25W25.
2) Smooth Coat: Two coats ConFlex XL High Build Coating A5W451 topcoat.
3) Fine Coat: Two coats of ConFlex XL Textured Medium A5W810 topcoat.
4) Extra Coarse Coat: Two coats of ConFlex XL Textured Extra Coarse A5W820 topcoat.

B. Galvanized Metal:
1. High Performance Coating, Water Based Urethane
a. Benjamin Moore:
1) Primer: One coat of Corotech V110 Acrylic Metal Primer or Corotech V175 Waterborne Bonding Primer.
2) Finish Coats: Two Coats Aliphatic Acrylic Urethane V500.
b. Pittsburgh Paints Company:
1) Primer: Pitt-Tech Plus 4020PF
2) Second Coat: Aquapon 98E-1 topcoat.
3) Finish Coat: Pitthane Ultra 95-8001.
c. Sherwin-Williams:
1) Primer: One coat Macropoxy 646-100 Fast Cure Epoxy.
2) Finish Coats: Two coats Pro Industrial Waterbased Acrolon 100 Polyurethane.

C. Shop Primed Metal Doors, Trim, Panels and Miscellaneous Surfaces:
1. High Performance Coating, Urethane: (rust inhibitive, UV stable)
a. Benjamin Moore:
1) Primer: One Coat of HP04 Acrylic Metal Primer

2) Finish Coats: Two coats of Super Spec Urethane Alkyd
b. Pittsburgh Paints Company:
1) Primer: Aquapon 98E-1.
2) Finish Coats: Pitthane Ultra 95-8001 Gloss.
c. Sherwin-Williams:
1) Primer: One coat Recoatable Epoxy Primer 67A5.
2) Finish Coats: Twp coats Acrolon 218 HS Polyurethane B65W611

D. Shop Zinc Primed Metal Surfaces:
1. High Performance Coating, Zinc, Epoxy, Urethane
a. Pittsburgh Paints Company:
1) Primer: Dinecote
2) Second Coat: Amerlock 600.
3) Finish Coat: Pitthane Ultra 95-8001 Gloss.
b. Sherwin-Williams:
1) Primer: One coat Zinc Clad IV (85).
2) Second Coat: One coat Macropoxy 646
3) Third Coat: One coat Acrolon 7300.

END OF SECTION

SECTION 10 11 00 – VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Visual display board assemblies, including the following:
   1. Porcelain-enamel markerboard
   2. Tackable panel

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

B. Shop Drawings: For visual display units.
   1. Include dimensional plans, elevations, sections, details, and attachment to other work.
   2. Show locations of panel joints. Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.
   3. Show locations and layout of special-purpose graphics.
   4. Include sections of typical trim members.

C. Product Schedule: For visual display units. Match the unit numbering shown in the Architect's Master Schedule.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For visual display units to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is unfeasible to ship in one piece, provide two or more pieces with joints in locations indicated on reviewed Shop Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace visual display boards that fail in materials or workmanship within Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

2.3 VISUAL DISPLAY BOARD ASSEMBLY, GENERAL

A. Visual Display Board Assembly: factory fabricated.
1. Corners: Square, as scheduled or indicated on drawings.
2. Width: As indicated on Drawings.
3. Height: As indicated on Drawings.
4. Mounting Method: Direct to wall, or as indicated on drawings.

2.4 PORCELAIN-ENAMEL MARKERBOARD PANELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ADP Lemco Incorporated.
2. Best-Rite Manufacturing; a brand division of MooreCo, Inc.
3. Claridge Products and Equipment, Inc.
4. PolyVision.

B. Basis of Design: Refer to Architect’s Master Schedule

C. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
1. Face Sheet Thickness: 0.021 inch uncoated base metal thickness.
2. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing.
3. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

D. Markerboard Panel: Scratch-resistant, porcelain enamel steel on core indicated.

E. Frame Profile: Manufacturer’s standard

F. Frames: Clear anodized extruded aluminum

G. Accessories:
1. Starting kit, including markers, erasers, magnets, pen holder and cleaning solution.

2.5 TACKBOARD PANELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Aywon.
2. Best-Rite Manufacturing; a brand division of MooreCo, Inc.
3. Claridge Products and Equipment, Inc.
4. Egan Visual Inc.

B. Basis of Design: Refer to Architect’s Master Schedule

C. Tackboard Panels:
1. Facing: natural cork.
2. Core: Manufacturer's standard.

D. Tackboard Panel: Natural-cork tackboard panel on core indicated.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motorized, sliding visual display units.

C. Examine walls and partitions for proper preparation and backing for visual display units.

D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.

E. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.4 CLEANING AND PROTECTION

A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 10 11 00

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents: Provisions established in Conditions of the Contract, Division 01 - General Requirements, and the Drawings are collectively applicable to this Section.

B. Section Includes
1. Identifying devices where shown on the Drawings complete and as specified including the following:
a. Interior code required signs.

1.2 SUBMITTALS

A. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.

B. Shop Drawings: Provide shop drawings for fabrication and installation of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, accessories, layout, and installation details.

C. Samples for Verification:
1. Physical: Submit samples of one competed sign for review and approval. Approved sample may be incorporated into Project.
2. Color: Submit manufacturer's standard color selection chart. Do not proceed until colors have been selected, reviewed and approved.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

B. Manufacturer shall have a minimum of five years experience in the manufacturing of signs specified.

C. Codes and Standards:
1. Panel signs shall have 1/32-inch raised copy and grade 2 Braille, and shall comply with all existing federal, state, and local accessibility standards.
2. Code and Standards: Comply with American with Disabilities Act of 1990, Title 3 Provisions, Public Accommodations and Commercial Facilities. Updated March 15, 2012.
3. Comply with the State of Texas Accessibility Standards, 2012 edition, as administered by the Texas Department of Licensing and Regulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following:
1. AGP (Architectural Graphic Products)
2. South Texas Graphics.

2.2 ROOM SIGNAGE SYSTEMS (INTERIOR CODE REQUIRED SIGNS)

A. Sign Face: Clear acrylic, 3/8 inch thick, painted first surface.
1. Adhesive: Pressure sensitive adhesive film, second surface.

B. Tactile Graphics and Text:
1. Fabrication: Provide tactile copy and grade 2 Braille raised 1/32 inch minimum from plaque first surface by manufacturer's stratification process as follows:
a. Refer to drawings~~,~~ photo-mechanical method.

2. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant ADA regulations and requirements indicated for size, style, spacing, content, position, and colors.

C. Non-Tactile Graphics and Text:
1. Fabrication options:
a. Clear acrylic, 3/8 inch thick, painted first surface.
2. Text or graphic technique: Vinyl cut-out letters.
3. Provide lettering and graphics precisely formed, uniformly opaque, and consistent in size, style, spacing, content, position, and colors.

D. Evacuation Map: Architect to provide one sample egress map artwork, signage contractor to provide all egress maps needed.

E. Overall panel size: As required to meet code requirements

F. Panel colors: As selected by Architect.

G. Text or graphic colors: As selected by Architect.

H. Letter styles, colors, letter sizes and layout position: As selected by Architect.

I. Installation Method: System SA, silicone adhesive and foam tape.

PART 3 - EXECUTION

3.1 DELIVERY AND STORAGE

A. Deliver and store identifying devices in protective wrappings until ready for installation. Install letters in protective wrappings and remove wrappings just prior to substantial completion.

3.2 INSTALLATION

A. Install signs plumb, level and square and in proper planes with other work, at heights required by accessibility codes and standards.

B. Anchor each plastic laminate sign with adhesive.

C. Install signs with sufficient amount of foam tape for proper installation.

D. Attach as recommended by sign manufacturer.

E. Anchor each sign with adhesive.

F. Coordinate arrival and installation of graphic signs with hardware installation. Graphic signs function as and are coordinated with the hardware as shown on the Drawings.

G. Room name signs shall be placed on the public side of the door except where noted otherwise.

H. Single Door Sign: Provide one sign as specified above, mounted to wall adjacent to door on knob side.

I. Pair of Doors: Provide one sign as specified above, mounted to adjacent wall closest to active leaf of door. Do not install sign where it will be obstructed by door when door is in the ‘open’ position.

J. Attachment: Mounting to surfaces shall be done by pressure sensitive frame double-faced tape. Signs shall be delivered to the project site with the tape in place and trimmed on each sign, but with the protective paper layer not removed. Paper layer shall be removed just prior to installation of signs.

3.3 +EXTERIOR INSTALLATION - PARKING AND DIRECTIONAL SIGNS

A. Mount posts in 12 inch round by 2'-6" deep concrete footing.

B. Handicapped Signs: Mount signs at height to comply with accessibility codes.

3.4 COORDINATION

A. Coordinate the installation of the identifying devices with the hardware manufacturer for lockset and knob leave outs as detailed and scheduled.

3.5 DAMAGE

A. Any identifying device which is scratched or defaced will be rejected.

3.6 CLEANING

A. Remove protective materials and clean all signs. Clean surfaces with plain water or water with soap or household detergent.

END OF SECTION

SECTION 10 22 38 - OPERABLE PANEL PARTITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Manually Horizontal Operable Acoustic Panels.

1.3 DEFINITIONS

A. NIC: Noise Isolation Class.

B. NRC: Noise Reduction Coefficient.

C. STC: Sound Transmission Class.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For operable panel partitions.
   1. Include plans, elevations, sections, details, numbered panel installation sequence, and attachments to other work.
   2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.
   3. Include diagrams for power, signal, and control wiring.

C. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:
   1. Panel Facing Material: Manufacturer's standard-size unit, not less than 3 inches square.
   2. Panel Edge Material: Not less than 3 inches long.
   3. Hardware: One of each exposed door-operating device.

D. Delegated-Design Submittal: For operable panel partitions.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Suspended ceiling components.
   2. Structural members to which suspension systems are attached.
   3. Items penetrating finished ceiling, including the following:
      a. Lighting fixtures.
      b. HVAC ductwork, outlets, and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Smoke detectors.
      f. Access panels.
   4. Plenum fire and acoustical barriers.

B. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.

C. Product Certificates: For each type of operable panel partition.
1. Include approval letter signed by manufacturer acknowledging Owner-furnished panel facing material complies with requirements.

D. Product Test Reports: For each operable panel partition, for tests performed by a qualified testing agency.

E. Sample Warranty: For manufacturer's special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals.
1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
a. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
b. Seals, hardware, track, track switches, carriers, and other operating components.
c. Electric operator and controls.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Panel Finish-Facing Material: Furnish full width in quantity to cover both sides of two panels when installed.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Faulty operation of operable panel partitions.
b. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design bracing of tracks to structure above.

B. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.
2. Noise-Isolation Requirements: Installed operable panel partition assembly, identical to partition tested for STC, tested for NIC according to ASTM E 336, determined by ASTM E 413, and rated for 10 dB less than STC value indicated.

C. Fire-Test-Response Characteristics: Provide panels with finishes complying with one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.
   2. Fire Growth Contribution: Complying with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 OPERABLE ACOUSTICAL PANELS

A. Operable Acoustical Panels: Partition system, including panels, seals, finish facing, suspension system, operators, and accessories.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Moderco Inc.
      b. Modernfold, Inc.; a DORMA Group company.
   1. Basis of Design: Refer to Architect’s Master Schedule.

B. Panel Operation: Manually operated, paired panels.

C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

D. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
   1. Panel Width: Standard widths.

E. STC: Not less than 56.

F. Panel Thickness: Not less than 3 inches.

G. Panel Materials:
   1. Steel Frame: Steel sheet, 16 gauge nominal minimum thickness for uncoated steel.
   2. Steel Face/Liner Sheets: Tension-leveled steel sheet, manufacturer's standard minimum nominal thickness for uncoated steel.
   3. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; ASTM B 221 for extrusions; manufacturer's standard strengths and thicknesses for type of use.
      a. Frame Reinforcement: Manufacturer's standard steel or aluminum.

H. Panel Closure: Manufacturer's standard unless otherwise indicated.

I. Hardware: As required to operate operable panel partition and accessories; with decorative, protective finish.
   1. Hinges: Full leaf butt hinges, attached directly to the panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.

2.3 SEALS

A. General: Provide seals that produce operable panel partitions complying with performance requirements and the following:
   1. Seals made from materials and in profiles that minimize sound leakage.
   2. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.

B. Vertical Seals: Deep-nesting, interlocking steel astragals mounted on each edge of panel, with continuous PVC acoustical seal.

C. Horizontal Top Seals: Continuous-contact, extruded-PVC seal exerting uniform constant pressure on track or PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on track when extended.

D. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.
   1. Mechanically Operated for Acoustical Panels: Extension and retraction of bottom seal by operating handle or built-in operating mechanism, with operating range not less than 1-1/2 inches between retracted seal and floor finish.

2.4 PANEL FINISH FACINGS

A. General: Provide finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.
   1. Apply facings free of air bubbles, wrinkles, blisters, and other defects, with invisible seams complying with Shop Drawings for location, and with no gaps or overlaps. Horizontal butted edges are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
   2. Where facings with directional or repeating patterns or directional weave are indicated, mark facing top and attach facing in same direction.
   3. Match facing pattern 72 inches above finished floor.

B. Markerboard Covering: Manufacturer's standard writable markerboard surface.

C. Cap-Trimmed Edges: Protective perimeter-edge trim with tight hairline joints concealing edges of panel and finish facing, finished as follows:
   1. Steel, Painted: Finished with manufacturer's color as selected by Architect from manufacturer's full range.

2.5 SUSPENSION SYSTEMS

A. Tracks: Steel or aluminum with adjustable steel hanger rods for overhead support, designed for operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
   1. Panel Guide: Aluminum guide on both sides of the track to facilitate straightening of the panels; finished with factory-applied, decorative, protective finish.
   2. Head Closure Trim: As required for acoustical performance; with factory-applied, decorative, protective finish.

B. Carriers: Horizontal Drive Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.

C. Track Intersections, Switches, and Accessories: As required for operation, storage, track configuration, and layout indicated for operable panel partitions, and compatible with partition assembly specified. Fabricate track intersections and switches from steel or aluminum.

D. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.

E. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

2.6 ACCESSORIES

A. Storage Pocket Door: Full height at end of partition runs to conceal stacked partition; of same materials, finish, construction, thickness, and acoustical qualities as panels; complete with operating hardware. Hinges in finish to match other exposed hardware.
   1. Rim Lock: Deadlock to receive cylinder, to secure storage pocket door in closed position. See Section 08 71 00 "Door Hardware" for lock cylinder and keying requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with ASTM E 557 except as otherwise required by operable panel partition manufacturer's written installation instructions.

B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.

C. Install panels from marked packages in numbered sequence indicated on Shop Drawings.

D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

3.3 ADJUSTING

A. Adjust operable panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust storage pocket doors to operate smoothly and easily, without binding or warping.

C. Verify that safety devices are properly functioning.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION 10 22 38

SECTION 10 26 00 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Wall guards.

1.3 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.

B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.
   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each impact-resistant plastic material, from manufacturer.

B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
   1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Section 01 40 00 "Quality Requirements."

D. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and Texas Accesibility Standards (TAS).

F. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
   1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.

2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
    a. Store corner-guard covers in a vertical position.
    b. Store wall-guard, bed-locator, and handrail covers in a horizontal position.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    a. Structural failures.
    b. Deterioration of plastic and other materials beyond normal use.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide handrails capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Uniform load of 50 lbf/ft. applied in any direction.
2. Concentrated load of 200 lbf applied in any direction.
3. Uniform and concentrated loads need not be assumed to act concurrently.

2.2 MATERIALS

A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; extruded and sheet material, thickness as indicated.
1. Chemical and Stain Resistance: Tested according to ASTM D 543.
2. Self-extinguishing when tested according to ASTM D 635.
3. Flame-Spread Index: 25 or less.
4. Smoke-Developed Index: 450 or less.

B. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.

C. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 for Alloy 6063-T5.

D. Stainless-Steel Sheet: ASTM A 240/A 240M.

E. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

F. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 WALL GUARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Balco, Inc.
2. Construction Specialties, Inc.
3. IPC Door and Wall Protection Systems; Division of InPro Corporation.
4. Korogard Wall Protection Systems; a division of RJF International Corporation.
5. Pawling Corporation.

A. Basis of Design: Refer to Architect's Master Schedule.

2.4 FABRICATION

A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Preform curved semirigid, impact-resistant sheet wall covering in factory for radius and sheet thickness as follows:
1. Sheet Thickness of 0.040 Inch: 24-inch radius.

C. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

D. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

E. Miter corners and ends of wood handrails for returns.

2.5 METAL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Remove tool and die marks and stretch lines, or blend into finish.
2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
3. Run grain of directional finishes with long dimension of each piece.
4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerancesand other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
   1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.
   2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
      a. Provide anchoring devices to withstand imposed loads.
      b. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches.
      c. Adjust end and top caps as required to ensure tight seams.

B. Impact-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00

SECTION 10 44 13 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Fire-protection cabinets for the following:
a. Portable fire extinguishers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.4 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.
1. Products: Subject to compliance with requirements, provide products by one of the following:
a. JL Industries, Inc.; a division of the Activar Construction Products Group.
b. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
c. Larsens Manufacturing Company.
d. Potter Roemer LLC.
1. Basis of Design: Refer to Architect’s Master Schedule.

B. Cabinet Construction: Cabinet construction to match rating of wall.
1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch- thick fire-barrier material. Provide factory-drilled mounting holes.

C. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
1. Provide projecting lever handle with cam-action latch .
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

D. Accessories:
1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
1) Location: Applied to cabinet door.
2) Application Process: Silk-screened.
3) Lettering Color: Black .
4) Orientation: Vertical.
b. In addition to providing cabinet identification, provide triangular signage above each extinguisher identifying the device from both sides

E. Materials:
1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
a. Finish: Baked enamel or powder coat.
b. Color: As selected by Architect from full range of industry colors and color densities.
2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
   1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
   2. Provide inside latch and lock for break-glass panels.
   3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
   4. Fire-Rated Cabinets:
      a. Install cabinet with not more than 1/16-inch tolerance between pipe OD and knockout OD. Center pipe within knockout.
      b. Seal through penetrations with firestopping sealant as specified in Section 07 84 13 "Penetration Firestopping."

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
      a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.7 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. JL Industries
      b. Amerex Corporation.
   1. Basis of Design: Refer to Architect’s Master Schedule
   2. Valves: Manufacturer's standard .
   3. Handles and Levers: Manufacturer's standard metal handles and levers .
   4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type: UL-rated, 10 lb capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

C. Purple-K Dry-Chemical Type in Aluminum Container (in common use kitchens): UL-rated 10-B:C, 2.5-lb nominal capacity, with potassium bicarbonate-based dry chemical in enameled-aluminum container.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. JL Industries
      b. Amerex Corporation.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
   1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
      a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
   1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

SECTION 10 73 23 - CANOPIES AND TRELLISES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.1 SUMMARY

A. Section Includes:
   1. Prefabricated metal canopies.

1.2 ACTION SUBMITTALS

A. Shop Drawings: Submit detailed drawings, layout of walkway cover system, bent locations (identify drain columns and wet bents), all mechanical joint locations with complete details, connections, jointing and accessories. Include details of concrete footings and bent anchorage.

B. Product Data: Submit manufacturer's product data, specifications, component performance data and installation instructions.

C. Samples: Canopy finishes

1.3 INFORMATIONAL SUBMITTALS

A. Calculations: Provide signed and sealed structural calculations for the proposed walkway cover, by a professional engineer registered in the state in which the Project is located and who professes his discipline to be structural engineering.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following except as other-wise indicated:
   1. Standard Building Code, latest addition with amendments, if any.
   2. AWS (American Welding Society) standards for structural aluminum welding.

B. Manufacturer: Obtain aluminum covered walkway system from only one manufacturer, although several may be indicated as offering products complying with requirements. Canopy manufacturer shall have a minimum of 10 years' experience in designing and installing the specified system.

C. Installer Qualification: Firm with not less than three years experience in installation of aluminum walkway covers of type, quantity and installation methods similar to work of this section.

D. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to insure proper fitting of work.
   1. Allow for adjustments within specified tolerations wherever taking of field measurements before fabrication might delay work.

E. Shop Assembly: Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

F. Coordination: Coordinate work of this section with work of other sections which interface with covered walkway system (sidewalks, curbs, building fascias, etc.).

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle covered walkway system components as recommended by manufacturer. Handle and store in a manner to avoid deforming members and to avoid excessive stresses.

1.6 WARRANTY

A. Manufacturer shall warrant the entire system against defects in labor and materials for a period of one (1) year commencing on the date of Substantial Completion.

B. Manufacturer shall warrant aluminum finish against defects (including fading, chipping, cracking, peeling) for a period of 10 years.

PART 2 - PRODUCT

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design canopy and covers.

B. System Performance: Provide covered walkway system that has been designed, produced, fabricated and installed to withstand normal temperature changes as well as live loading, dead loading and wind loading in compliance with Standard Building Code requirements for geographic area in which work is located and as follows:

C. Structural Requirements
1. Live Load: Refer to drawings
2. Structural design for wind forces: Comply with ANSI A58.1-1982
3. Base Mean Wind Velocity: Refer to drawings
4. Stability Criteria: Comply with applicable building codes.
5. Design structural members to meet minimum deflection criteria of L/180.
6. Design footings for maximum bearing pressure of 1,500 psf.
7. Dead Load: Weight of structure and all components plus a collateral load of 4 psf; 10 psf dead load minimum.

D. Sizes shown on Drawings are to be considered minimum.

E. Structure shall be capable of sustaining severe icing, hail, hurricane force winds and supporting a concentrated load such as being walked upon.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Avadek Walkway Cover Systems & Canopies.
2. Canopy Solutions
3. Dittmer Architectural Aluminum
4. Mapes Architectural Products.
5. Superior Metal Products.

B. Basis of Design: Avadek Walkway Cover System & Canopies

2.3 MATERIALS

A. Aluminum: Provide alloy and temper and finish as required to produce the Work.
1. Plate and Sheet: ASTM B 209
2. Extruded Bars, Rods, Wire, Shapes, and Tubes: ASTM B221, alloy 6063.
3. Extruded Structural Shapes: ASTM B 308.

B. Aluminum Deck Panels: Minimum .080 inches thick.

C. Unless otherwise indicated, beams to be open at top and drain canopy system internally into columns.

D. Fasteners:
1. All bolts and fasteners shall be stainless steel or finished to match adjacent components and sized by licensed engineer.
2. Deck Screws (rivets not permitted): Type 18-8 non-magnetic stainless steel sealed with a neoprene "O" ring beneath 5/8" outside dimension, conical washer.
3. Fascia Rivets: Size 3/16" by 1/2" grip range aluminum rivets with aluminum mandrel.
4. Bolts: All bolts, nuts and washers to be 18-8 non-magnetic stainless steel.
5. Tek Screws: not permitted

2.4 FABRICATION

A. Comply with indicated profiles, dimensioned requirements and structural requirements. Provide not less than 6 X 10 inch structural T-frames for main framing and not less than 5 x 9 inch tube purlins. Provide fascia no less than 6 inch round.

B. Beams and Fascias: Extruded aluminum sections of sizes and shapes required for compliance with design and performance requirements and Drawings.

C. Notch and fabricate for mechanical connection into one-piece rigid bents.

D. Provide cut-outs and internal deflectors in members as indicated to act as internal water drainage system.

E. Roll-Formed or Extruded Roof Decking with Cap: Self-flash and interlock into a composite unit.

F. Use sections true to details with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture, free from defects impairing strength and durability.

G. All welding to be done by heliarc process.

H. Bents shall consist of shop welded one-piece units. When size of bents do not permit shipment as a welded unit, concealed mechanical joints may be used.

I. Mechanical Joints: Stainless steel bolts with a minimum of two bolts per fastening. Bolts and nuts shall be installed in a concealed manner utilizing 1/2-inch thick by 1-1/2-inch aluminum bolt bars welded to structural members.
   1. Joints must be detailed on shop drawings showing all locations.

J. Roof Deck: Extruded Aluminum shapes, interlocking self-flashing sections. Shop fabricate to lengths and panels widths required for field assembly. Depth of sections to comply with structural requirements. Provide shop induced camber in deck units with spans greater than 16-feet to offset dead load deflections. Welded dams are to be used at non-draining ends of deck.

K. Expansion Joints: Design structure for thermal expansion and contraction. Provide expansion joints as required.

L. Exposed rivets used to fasten bottom of fascia to deck to have finish to match fascia.

M. Apply a shop-applied dip-coat of clear acrylic enamel to each column end terminating in concrete to insulate from electrolytic reaction. Column ends shall be pierced to "key" grout to bent for maximum uplift protection.

2.5 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Color and Gloss: As selected by Architect from manufacturer's full range

E. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for supporting members, blocking, inserts, installation tolerances, and other conditions affecting performance.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate and Furnish: Anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of items having integral anchors embedded in construction. Coordinate delivery of such items to the project site.

B. Promptly remove protective film, if any, from exposed surfaces of finished metals. Strip with care to avoid damage to finish.

3.3 INSTALLATION

A. General: Install system in accordance with manufacturer's printed installation instructions, submittals, applicable industry standards, and governing regulatory requirements for the Work.

B. Install canopies at locations and in position indicated, securely connected to supports, free of rack, and in proper relation to adjacent construction. Use mounting methods of types described and in compliance with Shop Drawings and fabricator's written instructions.

C. Anchoring to In-Place Construction: Use anchors, fasteners, fittings, hardware, and installation accessories where necessary for securing awnings to structural support and for properly transferring load to in-place construction.

D. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, Portland cement plaster, or dissimilar metals with a heavy coat of bituminous paint.

E. Coordinate awning installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed exterior wall and roof assemblies.

F. Expansion Provisions: Install running lengths to allow controlled expansion for movement of metal components in relation not only to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in a manner sufficient to prevent water leakage, deformation, or damage.

G. Install roof deck sections, accessories and related flashing in accordance with manufacturer's instructions. Provide roof slope for rain drainage without ponding water. Align and anchor roof deck units to structural support frames.
1. Install level and square to beams to avoid "out of square" conditions at beam ends.
2. Secure each contact point with a minimum of three stainless steel fasteners with 3/4 inch (19 mm) flat neoprene washers.

H. Fascia:
1. Install fascia using stainless steel fasteners.
2. Install prefabricated corners.

I. Sealant:
1. Seal at walls where canopy units contact surface.
2. Seal fabrication joints and seams away from view.
3. Seal other points where water penetration might be expected.

3.4 FLASHING

A. Provide flashings between canopies and adjoining structures are not work of this section.
1. Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim."

3.5 CLEANING AND PROTECTION

A. Damaged Units: Replace roof deck panels and other components of the work which have been damaged or have deteriorated beyond successful minor repair.

B. Cleaning: Remove protective coverings at time in project construction sequence which will afford greatest protection of work. Clean finished surfaces as recommended by manufacturer. Maintain in a clean condition during construction.

C. At the end of each work day, remove unused materials, debris and containers from the site.

D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that canopies are without damage or deterioration at time of Substantial Completion.

E. Replace damaged canopies that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

SECTION 11 61 33 – THEATRICAL RIGGING SYSTEMS

PART 1 - GENERAL

1.1 SECTION SUMMARY

A. This specification describes the renovation of the theatrical rigging equipment and stage drapery at the Auditorium Stage. Stage lighting hoists and controls replacement is and ALTERNATE to the base work.

1.2 RELATED DOCUMENTS

A. Theatre Rigging Drawings (“TR” Series) and general provisions of the contract including general and supplementary conditions and Division 1 Specification sections apply to this section.

1.3 RELATED WORK

A. Section 11 61 13: Acoustical Shell System.
B. Section 11 61 43: Stage Draperies.
C. Section 11 61 62: Theatrical Lighting Systems.
D. Section 27 41 16: Integrated Audio-Video Systems.
E. Division 26: Electrical Work.

1.4 REFERENCES

A. Published specification standards, tests or recommended methods of trade, industry or governmental organizations apply to Work in this section where cited below:
   1. American Iron and Steel Institute (AISI),
   2. American National Safety Institute (ANSI),
   3. American Society of Mechanical Engineers (ASME),
   4. American Society of Testing and Materials (ASTM),
   5. National Electrical Manufacturer’s Association (NEMA),
   6. Occupational Safety and Health Administration (OHSA),
   7. Underwriters Laboratories (UL),
   8. Entertainment Services and Technology Association (ESTA)
   9. Entertainment Technicians Certification Program (ETCP)
   10. National Electrical Code (NEC)
   11. National Fire Protection Association (NFPA)

1.5 DESCRIPTIONS AND REQUIREMENTS

A.

B. The following is intended to further describe the Work and clarify design intent and is not an exhaustive description of the Theatrical Rigging Systems. Refer to the Theatre Rigging Systems (TR Series) drawings for further information relating to this Section.

C. Auditorium Stage System Renovation - BASE
   1. Demolition
      a. Remove and dispose of all drapery, track, suspension media, and associated hardware.
      b. Coordinate disposal of all items according to owner’s instructions.
   2. New Equipment
      a. Provide new dead hung battens and suspension hardware from over stage structure to support drapery and track to match existing layout as located on the drawings. Inspect existing battens for the Valance and borders for reuse.
         1) The installed elevation of the new Valance and borders shall match the existing condition as field-measured from the stage centerline to the bottom hem of each drape.
      b. Provide new bi-parting traveler track and associated hardware to support the main drape, mid-stage traveler, and up-stage traveler curtains.
      c. Provide new walk-along traveler track to support the masking legs as located on the drawings.

D. Auditorium Stage Lighting Hoists and Controls – ALTERNATIVE
   1. Demolition
      a. Remove and dispose of (4) existing stage lighting line shaft hoists and (2) upstage utility battens, and controls. Existing lighting battens, cable management, and utility battens may

be reused upon inspection. Inspect batten clamps and lighting batten hanger assemblies before reuse.

2. New Equipment
   a. Provide (6) new hoists mounted to overstage structure designed to support the anticipated loads. Hoists shall be located to replicate as close as possible the location of existing lighting and utility battens.
   b. Provide new automated electronic hoist control system to allow operation of the stage electrics and utility battens. The hoist control system will include distributed motor control components, a rigging control panel, associated electrical cabling, conduit, plug boxes, and junction boxes as required to interconnect and operate the rigging hoists. Hoist control shall include an operator panel located on the stage left wall in the same location as the existing control system. Existing conduit may be reused.

E. Rigging and Drapery System: Black Box Theatre Addition
   1. Provide a pipe grid suspended from overhead structure as described on the drawings.
   2. Drapery for the stage area shall consist of multi-panel perimeter curtains as located on the drawings. All drapery will hang on a system of tracks as located and described and located in the drawings. Operation will be by hand using walk-along track hardware.

F. General Requirements
   1. Each rigging component must include the quantity of wire rope lift lines, trim chains, compression sleeve fittings, pipe or truss batten sections, and all necessary hardware for a fully operable rigging system.
   2. Draperies shall be constructed of professional grade fabric intended for use as stage curtains. All draperies will be certified as flame retardant as a result of either their inherent characteristics or chemical treatment in accordance with the AHJ.
   3. Adhere to and provide all needed repairs, inspections, and services as noted in the warranty portion of this specification.

1.6 RESPONSIBILITY AND RELATED WORK

A. The drawings included with this specification convey general system concepts. The plans do not show complete and accurate building details. The Contractor is responsible for making the field measurements necessary to establish exact locations, relationships, load capacities necessary for the installation of these systems. Coordinate the work with the General, Electrical and other related contractors as stated in Part 1.4, and the scheduled work of other trades.

B. Conduit infrastructure system, including wire for AC Power and grounding for the Theatre Rigging Systems, shall be provided as part of the contract. Coordination between different disciplines is required to achieve a proper conduit system installation and power provisions for Theatre Rigging Systems. The electrical installation shall be in accordance with division 26 and the National Electric Code.

C. Verify the requirements and integrate components of the theatre lighting power and control system mounted to rigging hardware.

D. Supply accessories and minor equipment items needed for a complete system, even if not specifically mentioned in these Specifications or on the associated Drawings, without claim for additional payment.

E. Notwithstanding any detailed information in the Contract Documents, it is the responsibility of the Theatrical Rigging Systems Contractor to supply systems in full working order. Notify the Architect of any discrepancies in part numbers or quantities before bid. Failing to provide such notification requires Theatrical Rigging Systems Contractor to supply items and quantities according to the intent of the Specifications and associated Drawings without claim for additional payment.

F. Obtain all permits necessary for the execution of any work pertaining to the installation, or any operation by the Owner including any associated charges or fees.

G. Execute all work in accordance with all Standard Authorities listed above, and all applicable State and Local codes, ordinances, and regulations. If a conflict develops between the contract document and the appropriate codes and is reported to the Architect prior to bid opening, the Architect will prepare the necessary clarification. Where a conflict is reported after contract award, propose a resolution of the conflict and, upon approval, perform work.

1.7 QUALITY ASSURANCE

A. Theatrical Rigging Contractor’s Qualifications: Firm experienced in the provision of systems similar in complexity to those required for this project; and meet the following:
   1. No less than five years’ experience with equipment and systems of the specified types under the same business name.
   2. Experience with at least five projects of comparable scale within the last two years.
   3. Employ only fully trained stage riggers and mechanics for the erection of the stage equipment.
   4. All theatrical rigging activity shall be supervised by an ETCP certified theatre rigger.

5. The stage riggers will be completely familiar with the type of equipment to be installed. A competent and knowledgeable Job Superintendent will be on the job at all times when work is in progress.
6. Maintain a fully staffed and equipped service facility.
7. Contractor shall attend pre-installation meetings to coordinate with other trades as required.

1.8 PRE-INSTALLATION SUBMITTALS:

A. The submittal information required by the specification is to be presented complete and as submissions noted below. Submittals are a crucial and integral part of the construction process; as such the Owner's consultant will not recommend payment to the Contractor above 25% of the scheduled value of this work until all submittal information has been approved. Cost for the Owner's consultant to review secondary and re-submittals due to the Contractor's failure to include all required submittal information, or rejection of incomplete or improperly prepared submittal information will be the responsibility of the Contractor. The cost shall be based on the hourly rates of the Architect and consultants as published in their current professional fees schedules and shall also include reimbursable costs for delivery, mailing, and photocopies at direct cost-plus ten percent (10%).

B. Project Submittal Part 1:
   1. Provide for approval not later than thirty (30) days after issuance of Notice to Proceed and prior to commencement of Work:
      a. Section 1: A complete schedule of submittals.
      b. Section 2: A chronological schedule of Work in bar chart form. Revise and resubmit schedule as required to reflect construction progress.

C. Project Submittal Part 2:
   1. Provide for approval no later than sixty (60) days after issuance of notice to proceed and in accordance with previously submitted submittal schedule.
      a. Section 1: Complete list of products to be incorporated within the Work.
      b. Section 2: Manufacturer’s data sheets for each product. Provide original manufacturer’s data sheets in order as they appear in the specification. These data sheets are submitted for each product in sufficient detail to facilitate proper evaluation to the products suitability for incorporation within the Work.
      c. Section 3: Fabric Samples. Submit a sample book of each fabric specified, containing manufacturer’s standard colors available in the quality of fabric specified for the Owner’s selection and approval of color. More than one color may be selected. After selection, upon request, submit one square foot sample of each fabric in each color for final review.
      d. Section 4: Submit Safety Data Sheets (SDS) for each potentially hazardous material prior to use. Include information pertaining to the hazardous material with the MSDS.
   2. Drawings:
      a. Provide computer software generated drawings using standard industry graphic standards. Hand or poorly drawn documents will not be accepted. All drawings shall be created on a computer aided drawing (CAD) system compatible with AutoCAD release 2013. Electronic files of theatrical rigging contract documents shall not be distributed for use in generating submittal documents with the exception of architectural backgrounds.
      b. Drawings depicting attachment of equipment to structure or mechanical assemblies that support overhead loads must show the work has been reviewed and sealed by a structural engineer licensed to practice in the State of Texas.
      c. Installation Drawings. Provide drawings showing special details depicting methods and means specific to each product and each product manufacturer’s recommended installation methods and means. Provide assembly and attachment for each product. Drawings should be reviewed and sealed by a structural engineer licensed to practice in the State of Texas.
      d. Schematic Drawings. Provide drawings detailing inter-component and intra-component, on Theatrical Rigging Contractor assembled components or fabricated products.
      e. Conduit and Electrical Drawings. If the system incorporates an electrical or electronic system of any type, provide floor plan drawings, including all walls, doors and rooms, showing exact power requirements and conduit routing for each system with the location of all junction boxes, terminations, etc.
      f. Equipment Drawings. Provide equipment mounting and location details including necessary physical dimensions, clearances, load limits, etc.
      g. Software diagrams showing the hierarchical structure of operator screens and functions with sample screen shots.
      h. Floor plan and Section Drawings. Provide drawings showing the exact location of all installed equipment on floor plans and/or sections such as guide wires or tracks, loft blocks, battens, etc.

i. Custom Enclosures and Millwork Drawings. If custom enclosures or millwork is required, provide full fabrication detail drawings indicating size, material, finish and openings for equipment.
j. Fabricated Plates, Panels, or Signage Drawings. If plates, panels, or signage is required, provide complete drawings depicting dimensioned locations of components, component types, engraving or printing information, plate material and color, and bill of material.
k. Labeling Drawing. Provide representative equipment labeling scheme of locking rail, loading rail, etc.
l. General Detail Drawings. Provide detail drawings depicting any unique installation methods specific to each product.
m. Any other pertinent data generated which is necessary to provide the Work.

D. Submittal Format:
1. Electronic submission of submittals is required for review.
2. Provide each submittal with a unique number and be numbered in consecutive order.
3. Provide each submittal file with a label reflecting the project title and submittal number.
4. Provide each submittal with a complete table of contents with the following information:
a. Project title and number.
b. Submittal number. In the case of a re-submittal, use the original submittal number immediately followed by the suffix “R” immediately followed by a unique number and be numbered in consecutive order.
c. Date of submission.
d. Referenced addendum or change-order number as applicable.
e. Referenced specification Section, Part, Article, Paragraph and page number or drawing reference as applicable.
f. Index Product Data sheets by manufacturer and model or part number.
5. Separate major grouping with labels.
6. Arrange product data list in alpha-numeric order when applicable followed by unspecified product arrange by manufacturer and model or part number. Follow list by manufacturer’s data sheets, arranged in the same order. If a data sheet shows more than one product, indicate the model being proposed with an arrow or other appropriate symbol.
7. Drawings executed at an appropriate scale, not smaller than ⅛” = 1’-0” for conduit/floor plans, ¼” = 1’-0” for equipment layouts, and ½” = 1’-0” for mounting details and plate/panel details.

E. Submittal Copies:
1. Electronic submission of submittals is required in PDF format.
2. Submit (2) sets of any product or sample finishes as required within this specification.

F. Resubmission Requirements:
1. Make any requested corrections or change in submittals required. Resubmit for review until no exceptions are taken.
2. Indicate any changes that have been made other than those requested.

G. Approval of Submittals: The submittal information will be reviewed by the general contractor, owner, Architects, engineers, and consultant. Each submittal package will be returned, stamped as follows:
1. “No Exceptions Taken” proceed with construction, all job site coordination will be at the direction of the general contractor.
2. “Make Corrections Noted: No Resubmission Required” submittals have been returned with conditional approval. Corrections, as indicated on the returned drawings and/or specifications, must be made before construction can begin.
3. “Make Corrections Noted: Submit Corrected Copy” submittals have been returned with conditional approval. Corrections, as indicated on the returned drawings and/or specifications, must be made in writing and returned to the consultant before construction can begin.
4. “REJECTED, Submit Specified Item” a specified item in the submittal has been rejected for the reasons noted. Re-submit in compliance with the specifications.
5. “REJECTED, Revise and Re-submit” submittal has been rejected for the reasons noted. Re-submit in compliance with the specifications.
6. “No Review Action Required” all information provided was for information or coordination purposes only. Review is not required.

1.9 PROJECT RECORD MANUAL

A. Submit three bound original sets (this is a minimum of two for the Owner and one for the Architect’s consultant; additional copies may be required by the project’s general conditions) after substantial completion and prior to final inspection.

B. The Project Record Manual shall be segregated into three separate bindings as follows:
1. Operations Manual:

a. Product Data: Product actually incorporated within the Work:
   1) Manufacturer's data for each type of product conforming to the scheme above. The list shall include manufacturer's serial numbers.
   2) Owner/Instruction Manual for each product.
   3) For custom circuits or modifications, a description of the purpose, capabilities, and operation of each item.
   4) Manufacturer's wiring diagram for each type of product actually incorporated.
   5) Separately bound list by manufacturer and model or part number of all products incorporated within the Work arranged in alphanumeric order.
b. Record drawings: Final rendition of that specified depicting what is actually incorporated within the Work. Provide one (1) full size PDF set and one (1) DVD-ROM containing all CAD generated drawings prepared in conjunction with this project. Drawing files to be in AutoCAD Release 2013 DWG format.
c. Test Reports: Recorded findings of testing specification of this specification.
d. System Operation and Instructions: Prepare a complete and typical procedure for the operation of the equipment as a system, organized by subsystem or activity.
   1) This procedure should describe the operation of all system capabilities.
   2) Assume the intended reader of the manual to be technically experienced but unfamiliar with the components and the facility.

2. Service & Maintenance Manual:
   a. Provide an original copy of the service manual on every piece of equipment for which the manufacturer offers a service manual. Arrange manuals in the same order as the operations manual.
   b. Manufacturer's maintenance and care instructions.
   c. Maintenance Instructions, including maintenance phone number(s) and hours; maintenance schedule; description of products recommended or provided for maintenance purposes, and instructions for the proper use of these products.
   d. Replacement parts list of all minor equipment such as fuses, lamps, connectors, knobs, etc.
3. Warranty Manual:
   a. Manufacturer's warranty statements on each product.
   b. Date of substantial completion and ending dates for warranties for each group of products.
   c. Software registration and licenses.

C. Include any other pertinent data generated during the Project or required for future service.
D. Appropriately duplicate data within the separate bindings when it will reasonably clarify procedures, e.g., operational data in maintenance binding.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Ship product in its original container, to prevent damaging or entrance of foreign matter.
B. Handling and shipping in accordance with manufacturer's recommendation.
C. Provide protective covering during construction, to prevent damaging or entrance of foreign matter.
D. Replace at no expense to Owner, product damaged during storage, handling or the course of construction.

1.11 PROJECT CONDITIONS

A. Verify conditions on the job site applicable to this work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.
B. The Drawings diagrammatically show arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install work as shown, recommend solutions and/or submit drawings to the Architect for approval, showing how the work may be installed.

1.12 FINAL INSPECTION AND TESTING

A. Upon completion of installation, initial adjustments, tests and measurements specified in Part 3, and submission and review of the results, a final inspection and test will be observed by the Architect and/or Architect's Consultant no earlier than two weeks after receipt of the written results.
B. Provide a minimum of one (1) person for inspection and two (2) persons for testing familiar with aspects of the System to assist the Owner.
C. The process of testing the System may necessitate moving and adjusting certain components such as counterweights on arbors, adjustment of drapery tracks, etc.
D. Testing includes operation of each major system and any other components deemed necessary. Perform tests and provide required test equipment, tools and material required to make any necessary repairs, corrections, or adjustments.
E. The following procedures will be performed on each System:
   1. Inspection of the methods and means employed to incorporate the System within the facility.

2. Verification of proper operation, from controlling devices to controlled devices.
3. Verification of proper adjustment, balance, and alignment of equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings for each setting, and appropriately record these settings within the Record Documents.
4. Other tests on equipment or systems deemed appropriate.

F. In the event the need for further adjustment or work becomes evident during testing, the Theatrical Rigging Contractor is to continue work until the System is acceptable at no addition to the contract price. If approval is delayed because of defective equipment, or failure of equipment or installation to meet the requirements of these specifications and any extension of the inspection and testing period is required, the contract price will be reduced for the additional time and expenses of the Owner, at the standard rate in effect at that time.

G. Rigging system Contractor shall return to the jobsite six months after acceptance to inspect the rigging hardware and attachments, curtain tracks, curtains, and battens.

1.13 WARRANTY

A. Warrant labor and product for two (2) years following the date of substantial completion to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics. Repair or replace defects occurring in labor or product within the Warranty period without charge. Any cost required to complete this warranty repair is the responsibility of the contractor.

B. This warranty is in addition to any specific warranties issued by manufacturers for greater periods of time.

C. Within the warranty period, answer service calls within eight hours, and correct the deficiency within twenty-four hours.

D. This warranty shall include two (2) ANSI-compliant annual inspections. The inspection shall be a minimum level one inspection for manually operated systems and shall be a level two inspection for all motorized equipment. The first will occur 1-year after the project’s substantial completion, and the second shall occur before the end of the two (2) year warranty. The Contractor shall provide the inspections at no cost to the Owner and at an agreed-upon time and date. The Contractor shall provide a full report with deficiencies or findings. All repairs covered by applicable warranties will be completed.

1.14 INSTRUCTION OF OWNER PERSONNEL

A. After final completion, provide instruction to Owner and/or the Owner’s designated personnel on the use, operation, maintenance and care of the System.
1. Develop training course based on the use of the System and manufacturers’ recommendation. Provide (8) hours of training. The training period shall be divided into two segments and shall be scheduled at least two weeks apart. All training shall be scheduled at the convenience of the owner and designated personnel.
2. Submit an outline of the course with sample instructional aids for approval (30) days prior to scheduled instruction sessions.
3. If a representative of the manufacturer is used in the instructional course, the Theatrical Rigging Systems Contractor must be present throughout the extent of the course and ensure that the representative abides by the requirements set forth in these specifications.

B. Contractor shall be present at the first two (2) uses of the facility.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Model name and number for manufacturers included in this specification are listed to establish a standard of product quality.

B. Substitution of specified products with other qualified manufacturers and products will be considered providing:
1. Proper substitution procedures outline under Division 1 is adhered to.
2. A request for substitution of each specific product must be made in writing by a bidding Contractor not less than ten (10) business days prior to bid for written approval of the Architect.
3. Sufficient data of the products is presented for prior approval including technical data, manufacturer’s specifications, samples, and, if requested, results of independent testing laboratory tests.
4. Written permission is obtained for the substitution from the Owner or Owner’s Representative.

C. If proposed system includes equipment other than specified model numbers, submit a list of major items and their quantities, with a one-line schematic diagram for review. Include a list of previously installed projects using proposed equipment that are similar in nature to specified System.

D. Provide product not specifically specified commensurate with the quality and standards established by the specified product.

2.2 GENERAL

A. Products shall be new, free from defects and listed by UL when an applicable UL Standard exists. Provide product of a given type from one manufacturer.

B. Regardless of the length or completeness of the descriptive paragraph herein, provide product complying with the specified manufacturers' published specifications.

2.3 CONTACTS

A. Listed below is contact information for Manufacturers of rigging components approved to provide equipment on this project:

B. Automatic Devices Company
   1. 2121 S. 12th Street, Allentown, PA. 18103
   2. Telephone: (610) 797-6000
   3. Approved to supply curtain track and curtain motors.

C. Wenger (JR Clancy)
   1. 7041 Interstate Island Road, Syracuse, NY 13209
   2. Telephone: (315) 451-3440
   3. Approved to supply stage rigging components, motorized hoists, hoist control, beam clamps, and associated hardware.

D. Electronic Theatre Controls
   1. 3031 Pleasant View Rd, PO Box 620979, Middleton WI 53562
   2. Telephone (608) 831-4116
   3. Approved to supply rigging hoists and controls.

E. H&H Specialties
   1. P.O. Box 9327, South El Monte, Calif. 91733
   2. Telephone: (213) 283-3562
   1. Approved to supply stage rigging loft/head blocks, curtain tracks, and curtain motors.

F. Texas Scenic Company
   1. 8053 Potranco Rd, San Antonio, Texas 78251
   2. Telephone: (210) 684-0091
   3. Approved to supply rigging Hoists and controls, rigging hardware, stage drapery.

G. IWeiss
   1. 815 Fairview Avenue Suite 10, Fairview, New Jersey, 07022
   2. Telephone: (201) 402-6500
   3. Approved to supply rigging hardware, stage drapery, stage rigging loft/head blocks, and curtain tracks.

H. Protech Theatrical Services
   1. 3431 N Bruce Street. North Las Vegas, Nevada 89030
   2. Telephone: (702) 639-0290
   3. Approved to supply rigging hardware. stage drapery, stage rigging loft/head blocks, and curtain tracks.

I. Thern, Inc.
   1. 5712 Industrial Park Rd, Winona, Minnesota, 55987
   2. Telephone: (800) 553-2204
   3. Approved to supply stage rigging components, motorized hoists, hoist control, fire safety curtains and accessories, beam clamps, and associated hardware.

2.4 RIGGING HARDWARE

A. Pipe-Grid Batten Assemblies
   1. Pipe battens shall be constructed of new ASTM A53/A 1½" nominal schedule 40 plain end steel pipe.
   2. Battens exceeding one standard pipe length will be joined using an internal splicing sleeve. Splices must provide the same overall capacity, deflection, and strength to the pipe battens as an un-spliced span. Threaded couplers are not permitted.
      a. Splice sleeves shall be a minimum of 18" in length with a minimum of 9" extending into each pipe batten.
      b. Sleeves will be machined to a diameter that will create a snug fit within the pipe battens.
      c. Splicing sleeves will be fastened to the pipe batten with pins or min $^{5}/_{16}$" diameter bolts. Locate at least two fasteners on each side of splice joint; alternate direction of fasteners at right angles to one another across the diameter of the pipe.

3. Any fasteners used on pipe battens must meet SAE grade 5, and be equipped with self-locking nuts.
4. Cover the end of each batten with a yellow or white closed end, soft vinyl safety cap at least 4 inches in length. Omit end caps for battens used in a pipe grid.
5. Lineset battens shall be labeled permanently with a prominent center-line mark.

B. Batten Connections
1. Wire rope lift lines shall terminate directly to trim chains constructed of NACM chain certified by their manufacturer as suitable for the intended purpose.
2. Chain shall be nominal ¼" diameter or larger, and of sufficient length to wrap one and one-half times around the pipe batten and return to the eye of the wire rope lift line.
3. One chain end shall be terminated directly to the wire-rope eye, the other end secured with a forged screw pin anchor shackle rated for the intended purpose.
4. Alternative designs for batten connection and trimming methods shall require approval as part of the submittal process.
5. Where a pipe clamp may be required on a batten, a wrap-around type clamp shall be provided. This clamp shall be secured to the pipe using SAE 5 grade bolts, washers, and self-locking nuts.
6. Acceptable products:
   a. Clancy Alpha Chain
   b. 7 mm (0.275″) Grade 63 alloy chain

C. Wire Rope Lift Lines
1. Provide lift lines and fittings appropriate for supporting the load requirements.
2. For hoisted and dead-hung sets: lift lines shall be a minimum of ¼” diameter 7 X 19 construction, galvanized aircraft cable with a breaking strength of 7000 lbs.
3. All wire rope must be new; damaged or deformed cable may not be used.
4. Exposed ends of wire rope shall be cut cleanly, then seized as necessary.

D. Wire Rope Termination
1. To connecting hardware, form eyes around an appropriately sized thimble using copper Nicopress® compression sleeves.
2. To cable drums: terminate the wire rope on the inside of the lifting drum using a Nicopress® compression stop sleeve.
3. Supply and install compression sleeves or clips in size and quantity per guidelines set forth in the Wire Rope User’s Manual, by its manufacturer’s specifications, and in accordance with industry guidelines.

E. Rigging Accessories:
1. In certain instances special component parts, such as sheaves, idler blocks, extra lines, etc., will be necessary in order to provide a fully operable system. Where such requirements are necessary, furnish, install, and adjust these components comparable to the quality of the products listed in these specifications.
2. Acceptable manufacturers:
   a. H&H Specialties
   b. JR Clancy
   c. Crosby

2.5 BATTEN HOIST

A. Provide a motorized hoisting system for each of the lighting and shell ceiling battens as located and described in the drawings. Each hoist shall be powered from the Motor Control Center (MCC) and be controlled from a remote operator panel. Each batten location shall have a single hoist machine attached to structural steel. Hoists shall be located and sized to the loads as described in the TR-series drawings.

B. The hoist shall lift the batten at a fixed nominal rate of 20 ft/min.

C. The drive motor shall be flange-mounted (NEMA C-face) to a speed reducing gearbox sized to drive the specified load. The use of chain sprockets, timing belts, or similar non-integral connections in the power train is not permitted.
1. Gearbox assemblies must have double shaft seals or be provided with drip pans.
2. The gearbox shall have a minimum service factor of 1.25.

D. The motor shall be equipped with an integral spring-set, electrically released brake capable of providing a retarding torque of at least 200% of the rated full load motor torque. The brake must provide fail-safe operation in holding the load while the motor coils are de-energized. The motor control scheme must ensure that the brake not release unless the motor has developed adequate holding or lifting torque upon energization. The brake shall have a provision for manual release for use in commissioning and maintenance.

E. Each lift line attached to a batten will spool onto an individual steel drum driven by a common shaft.
1. Drums shall be fabricated from steel pipe or tubing sized of a thickness suitable to the load, and

long enough to store wire rope sufficient to allow the specified load travel plus three additional wraps in a single layer.

2. The drum shall have a helical groove sized properly for the specified wire rope and with a minimum pitch diameter of 30 times the rope diameter.
3. The drum will couple to the driving shaft using a welded flange and appropriately sized key and keyway. Lifting lines shall fasten to the drum through holes drilled from root of the cable groove through the tubing wall. Fastening holes shall be drilled at an angle of 45° from the radius and along the axis of the groove. Size the fastening hole to allow the wire rope to pass through but to be held in place Nicopress© stop sleeve.

F. The drive shaft must couple directly to the output stage of the gearbox. Shafts shall be supported along its length with self-aligning bearings as necessary for the installation.

G. The hoist must have a redundant braking system. This may be implemented as a mechanical over-speed brake attached directly to the drive shaft. The over-speed brake shall be sized and adjusted to lock rotation of the hoist shaft should it rotate faster than the nominal design speed of the hoist. This brake shall engage in the event that the motor-end brake, gearbox, other rotating or electronic components fail and cause the hoist shaft to rotate freely and in an uncontrolled manner under load. Other braking schemes must be submitted for approval.

H. Each hoist shall be equipped with an industrial rotary cam limit switch assembly which will provide normal end-of-travel and emergency over-travel signaling to the MCC Control System. Traveling-nut type switch assemblies are not acceptable for use.

1. The limit assembly shall provide four (4) normally closed (N.C.) contacts, two for each direction of travel as noted above. The position of each contact opening along the distance of travel must be individually adjustable in the field.
2. Selection and gearing of the limit assembly must allow the driven load to stop at a repeatable position with ¼ inch of accuracy.
3. Limit assemblies may be directly coupled to the drive train, or may be driven using roller chain or toothed (timing) belts with the provision that these latter are fully guarded.

I. Each hoist shall be equipped with a solid state position encoder integrated with the mechanical and electronic controls to provide a minimum ⅛” repeatable positioning accuracy.

J. Each hoist must have a local means to disconnect its motor from the power supply

1. Provide wireway, cabling, cabling, and connectors for separate low-voltage control circuits and three-phase power to each hoist. Cabling shall conform to the hoist manufacturer’s specifications.

K. Lighting Equipment Integration

1. Existing pantograph cable management may be reinstalled for the stage electrics, and shall provide a permanent electrical connection for the lighting system circuits on the over stage lighting battens linesets.
2. The system shall allow the batten to move without disconnecting electrical cables, and without fouling any component of the hoisting mechanism.

2.6 HOIST CONTROLS

A. The control system shall be specifically designed for use with the hoists installed with the system.

B. Motor Control Center (MCC)

1. Components for the operation of the hoists shall be housed in a NEMA 12 enclosure as located on the drawings
2. MCC shall include:
   a. Branch circuit protection.
   b. Through-door disconnect switch.
   c. Low voltage control power supplies.
   d. Motor starters and/or reversing contactors as required.
   e. E-Stop and limit control.
   f. Interface electronics and logic components compatible with the supervisory and operator controls (RCP.)
3. The MCC shall house an "Emergency Shutdown Switch" (EStop) that will be clearly visible on the front of the enclosure. This switch will disconnect the main power source and will render the entire system inoperable.
4. Front display indicators shall be provided to include include power and fault status.

C. User Interface (RCP)

1. The RCP shall be either
   a. Wall-mounted type with pendant operator accessory, or
   b. Full-featured pendant type.
2. The control system shall be purpose-designed and fabricated to manage and operate hoists specifically designed for overhead lifting. The systems shall incorporate mechanical, electrical and

safety features that shall be inherent to this equipment and shall provide an engineered, efficient device to control the equipment.

3. The following features shall be included:
   a. RCP shall consist of a surface, flush or panel mounted primary control panel and external remote E-stop stations.
   b. Key operated enable switch
   c. LCD display with feedback/operating information
   d. Key operated hoist load profile training/enable switch
   e. Hoist selection buttons with rear illuminated naming tabs
   f. Rear illuminated hold-to-operate (dead-man) up and down operation buttons
   g. Dedicated E-stop button
   h. Outlet for wired remote
   i. The controller shall be UL Listed and shall be fabricated from UL Listed components.
   j. A single Cat 5e cable shall provide the power and communication wiring between the power and control wiring devices and the RCP.
4. Up to (4) hoists may be selected to move at one time.
   a. When the up or down button is pushed and held each hoist shall move to its next stop location in the selected direction of movement.
   b. If the stop location is the adjustable preset, the hoist can be made to continue to travel in the selected direction by releasing and re-pressing the up or down hold-to-operate button until the next stop for the hoist(s) is reached.
5. E-Stop
   a. The E-stop button on the RCP and each remote station shall be a mushroom button with a rear illuminated ring surrounding the button.
   b. During normal operation the E-stop button shall be in the out position. An E-stop can be activated via this button by firmly pressing the button in.
   c. The button will latch and will immediately cause a class zero stop of all hoists in the system.
   d. The LCD screen shall report the E-stop as an E-stop fault. To continue system operation the E-stop button must be cleared by twisting the button to release the latch.
   e. An E-stop condition must be acknowledged at the control station.
   f. An acknowledgement of the E-stop condition shall initiate an automatic self-test of the system safety functions including safe opening of all E-stop contactors.
   g. The illuminated ring around the E-stop button shall change intensity depending on whether the system is moving or not.
   h. The illuminated ring around the E-stop button shall blink in case of an E-stop condition.
   i. The E-stop system shall be completely hard-wired. A system that relies on software or bus system to transmit E-stop signals shall not be acceptable for this installation.
   j. The E-stop signal shall be provided in parallel to all E-stop contactors in the hoists. A single E-stop contactor failure shall only affect a single hoist.
6. System Diagnostics
   a. Upon energization, the control system automatically shall perform a series of diagnostic tests that shall assure that all system safety functions are working. Should an error in the safety functions be determined the controller shall report back a fault condition in the LCD display window and shall identify the nature of the fault.
   b. Should the controller be continuously energized, the system automatically shall perform a series of diagnostic tests every 30 days to determine if there are any problems with any portion of the hoisting control system safety features. In the event of a problem, the controller shall report back a fault condition in the LCD display window and shall identify the nature of the fault.
   c. The automatic self-tests shall include a complete test of all Emergency Stop contactors for their respective ability to reach the off state.
   d. Eleven months after a system inspection has been performed, the system will remind the user to schedule full system maintenance/inspection. The reminder will remain in the system until it is turned off by the factory authorized and trained inspector.
   e. The system inspection reminder shall show the number of days remaining until the system inspection, or the number of days the inspection is overdue.
7. Remote Control Pendant
   a. A remote control pendant with a 30’-0” long attached cable and plug shall be provided for the system. The remote control must be plugged to the RCP. When the remote control is plugged in the E-stop on the remote is active.
   b. The remote control provides up/down control for those hoists that have been preselected at the RCP.

8. Acceptable product(s)
    1) Texas Scenic, Pioneer 1 Preset Station with remote pendant
    2) Thern, 8XFS, Wall-Mounted Station with remote pendant
    3) Or, approved equal.

2.7 FIXED LIGHTING PIPES AND PIPE GRIDS

A. Provide and install pipe assemblies attached to structure as described in the drawings.
B. Assemblies shall be constructed of new ASTM A53/A 1-½" nominal schedule 40 plain end steel pipe.
C. Any fasteners used on pipe battens must meet SAE grade 5, and be equipped with self-locking nuts.

2.8 STAGE DRAPERY TRACKS

A. Straight Draw Curtain Tracks
1. Provide and install the curtain tracks as located and configured on the drawings.
2. Track shall be constructed of 14 gauge galvanized steel, roll formed to a 2-⅝" W X 2-¾" H channel with continuous slot in bottom. Provide un-spliced lengths up to 26' in length.
3. Track must mount to pipe battens on maximum 5'-0" centers with two-piece hangers formed from 11-gauge steel.
4. Provide a minimum of 3'-0" overlap in the center. Separate tracks at center with two overlap clamps.
5. Install carrier stops with at each end of track.
6. Provide single carriers, spaced 12" on center, constructed of (2) nylon-tired ball bearing wheels fastened parallel to carrier body. Supply carriers with heavy duty hook, swivel eye, and trim chain for attachment of drapes. Install neoprene bumper between each carrier to reduce noise.
7. Provide back-pack accessories to allow curtain to draw open from trailing (offstage) end.
8. Provide master carriers with 4-wheel nylon-tired ball bearing assemblies with bodies formed from 11 gauge steel. Connect to operating line with two formed steel cord clamps attached to each body. Supply each master carrier with two heavy duty hooks, swivel eyes, and trim chains for attachment of leading edge of drape.
9. Single and double end pulleys will clamp securely to the underside of the track channel and will be equipped with 6" diameter Nylatron GS sheaves grooved for up to ½" hand line. Install (2) ⅝" sealed precision ball bearings in each sheave. Lock shaft to side plate on head end with $^{3}/_{16}$" keeper pin to prevent rotation and install fine threaded nylon insert lock nut.
10. Dead-end pulley shall be mounted at 45 degrees from the traveler tracks where required to reduce clearance for pulley between pipe battens.
11. Provide a sand-bag tension pulley for operation of hand line of the travelers. Provide adequate quantity of sand for proper hand line operation.
12. Hand line shall be ½" diameter, stretch resistant rope with spun polyester outer jacket double braided over solid polyester core.
13. Acceptable products:
    a. H&H Specialties series 400
    b. ADC series 280

B. Walk-along Curtain Tracks
1. Provide materials and the labor to install the curtain tracks as located and configured on the drawings.
2. Track shall be made of 6063-T5 aluminum, extruded into 2-½" I-beam with 1" wide top, intermediate and bottom flanges. Provide un-spliced lengths up to 24' in length.
3. Track must mount to pipe battens on maximum 5'-0" centers with two-piece hangers formed from 11 gauge steel hangers.
4. Provide single carriers, spaced 12" on center, constructed of (2) Delrin wheels fastened parallel to formed steel carrier body. Supply carriers with swivel hook for attachment of drapes. Install Nylatron wear strips at contact points to act as a bumper between each carrier to reduce friction. Provide neoprene bumpers between each carrier to reduce noise.
5. Provide walk along handles attached to the master carriers for operation of the curtain.
6. Provide end stops at each end of the track.
7. Ensure that all steel components are zinc plated for corrosion resistance.
8. Provide all track and associated hardware for the Black Box factory coated BLACK
9. Acceptable products:
    a. H&H Specialties series 300
    b. ADC series 140

2.9 COMPLETED SYSTEM

A. General
1. All installation of stage rigging equipment shall be completed utilizing new materials, free from flaws and rust, and in good working order. The jobsite shall be cleaned of all packing materials, lubricants, metal shaving, miscellaneous hardware, and components not used in the installation.
2. All dimensions are to be field verified. Location and attachment of hardware and size of components shall be confirmed by the stage rigging Contractor.
3. All electrical power, outlets, related systems, and structural elements required to make the system fully functional are the responsibility of the contractor.
4. If components and hardware are not specifically specified or called out, it is the responsibility of the contractor to provide those components in order to provide a fully operational theatre rigging system.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate incorporation of the Work specified herein with other project work so as to facilitate a cohesive final product.
B. Mount equipment and enclosures plumb and level.
C. Permanently installed equipment to be firmly and safely held in place in accordance with specified safety factors and Federal and State codes and regulations.
D. Work shall be completed within industry guidelines, including: ESTA, OSHA, NEC, ANSI, ASTM, AISC, NFPA, NEMA, plus any or all local, governmental, or other applicable codes.
E. Where dimensions and loading capacities have been omitted from this specification, they are to be determined by the Contractor, in accordance with the accepted industry standards and guidelines in this section. In no way will the theatre rigging contractor be relieved of primary responsibility to provide a safe, fully functional system.
F. The mechanical fabrication and workmanship will incorporate the best practices for good fit and finish. There will not be any burrs or sharp edges to cause a hazard, nor will there be any sharp corners accessible to personnel.
G. All equipment will be installed based on the manufacturer's recommendations and for the use intended by the manufacturer.
H. All shop and field welding will meet the qualifications of the AISC manual and will be without spatter or other evidence of poor practices.
I. All finishes which are disturbed during shipping and installation will be touched up to match the original.
J. Materials will conform to the following ASTM standard specifications:
1. A-36 structural steel
2. A-36 steel plates and bars
3. A-47 malleable iron casting
4. A-48 gray iron casting
5. A-53 welded and seamless steel pipe
6. A-120 black and hot dipped zinc-coated steel pipe
K. In order to establish minimum standards of safety, the following factors will be used:
1. cables and fittings provide a minimum 8:1 design factor
2. cable bending ratio is 30 times the cable diameter
3. nuts and bolts use minimum SAE grade 5 (ASTM rating A-449)
4. thread pressure of
a. 500 lb. for cast iron
b. 1000 lb. for steel
c. 1500 lb. for Nylatron
5. steel designed to 1/5 of yield
6. bearings are rated for two times the required load operating at full speed for 2000 hours.

3.2 INSTALLATION OF STAGE DRAPES AND TRACKS

A. Install all tracks and hardware according to manufacturer’s recommendations.
B. Stage draperies shall be installed near the end of the installation when chances of damage from other work are reduced. Stage area shall be broom clean with no further construction taking place prior to installation.
C. After hanging stage draperies, thoroughly brush to remove dust, visible dirt, loose threads, loose fabric lint, etc. Wrinkles will be allowed to fall out naturally.

3.3 LABELING OF EQUIPMENT

A. Mark and label each batten with its set number, load/arbor capacity, stage centerline, and lift line locations with appropriate paint.

B. Provide labels clearly indicating date of manufacture, cloth type, manufacturer's name and address, size (width and height using 3/4" minimum lettering), and Owner's designated inventory number (to be coordinated with Owner) will be sewn into the back (in most cases, upstage) side of the upper hem at both ends of each drape panel.

3.4 CONTRACTOR COMMISSIONING

A. Prior to energizing or testing the System ensure the following:
   1. Products are installed in proper and safe manner according to manufacturer’s instructions.
   2. Dusts, debris, solder splatter, etc. is removed.
   3. Labeling has been provided.
   4. Temporary facilities and utilities have been properly disconnected, removed and disposed of off-site.
   5. Products are neat, clean and unmarred and parts securely attached.
   6. Broken work, including glass, raised flooring and supports, ceiling tiles and supports, walls, doors, etc. have been replaced or properly repaired, and debris cleaned up and discarded. Job site shall be left broom clean.

B. Provide two portable VHF or UHF business band radios for use during acceptance testing with transmission range sufficient to cover entire project.
   1. Include rechargeable batteries and re-charger along with "holster" for wearing on belt.
   2. Radios to be available for duration of testing process, including any follow-up visits required prior to final acceptance.

End of Section 11 61 33

SECTION 11 61 43 – STAGE DRAPERIES

PART 1 - GENERAL

1.1 SECTION SUMMARY
- A. This specification describes the manufacture and installation of stage curtains at the Auditorium Stage.

1.2 RELATED DOCUMENTS
- A. Theatre Rigging Drawings (“TR” Series) and general provisions of the contract including general and supplementary conditions and Division 1 Specification sections apply to this section.

1.3 SECTION INCLUDES
- A. Coordination, provision, installation, inspection, commissioning, testing, documentation, instruction and warranties of a Stage Drapery System.
- B. Plant, materials, equipment, transport and labor necessary to accomplish this and have a complete and proper System.
- C. Also includes:
  1. Required licenses and permits including payment of charges and fees.
  2. All fees for flame proofing, testing, documenting, and notary public services.
  3. Verification of dimensions and conditions at the job site.
  4. Provision of required pre-installation submittals and project record manuals.
  5. Installation in accordance with the contract document, manufacturer's recommendation, and in conformity with applicable codes and authority having jurisdiction.

1.4 RELATED WORK
- A. Section 11 61 33: Theatrical Rigging Systems.

1.5 REFERENCES
- A. Published specification standards, tests or recommended methods of trade, industry or governmental organizations apply to Work in this section where cited below:
  1. National Fire Protection Agency (NFPA)
  2. American National Safety Institute (ANSI),
  3. American Society of Testing and Materials (ASTM),
  4. Occupational Safety and Health Administration (OHSA),
  5. Underwriters Laboratories (UL),
  6. Entertainment Services Technology Association (ESTA)

1.6 DESCRIPTIONS AND REQUIREMENTS
- A. The following is intended to further describe the Work and clarify design intent and is not an exhaustive description for the Stage Curtains. Refer to the Theatre Rigging (TR Series) drawings for further information relating to this Section.
- B. Auditorium Stage
  1. Provide new drapery for the stage to match existing.
  2. Drapery for the stage shall consist of a valance and main curtain, masking legs and borders, a mid-stage act curtain, an upstage blackout curtain, and cyclorama as described on the drawings.
  3. Drapery and associated hardware shall mount on lineset battens.
     a. The main curtain, mid-stage act curtain, and blackout curtain, each consisting of two (2) matched fabric panels, will part at their centers and draw open on a traveler track. The main curtain shall fully clear the proscenium when opened.
     b. The side tabs and masking legs shall be track mounted; operation will be by hand using walk-along track hardware.
     c. Borders, and the cyclorama will tie directly to lineset battens.
     d. Loose/spare legs and borders to be provided for user installation as required.
- C. General Requirements
  1. It is the responsibility of the stage curtain provider to ensure the proper size and fit of the drapery within the facility.
  2. All drapery shall be sized and verified based on field measurements prior to fabrication.

1.7 RESPONSIBILITY AND RELATED WORK

A. The drawings included with this specification convey general system concepts. The plans do not show complete and accurate building details. The Contractor is responsible for making the field measurements necessary to establish exact locations, relationships, load capacities necessary for the installation of these systems. Coordinate the work with the General, Electrical and other related contractors as stated in Part 1.4, and the scheduled work of other trades.
B. Supply accessories and minor equipment items needed for a complete system, even if not specifically mentioned in these Specifications or on the associated Drawings, without claim for additional payment.
C. Not withstanding any detailed information in the Contract Documents, it is the responsibility of the Contractor to supply systems in full working order. Notify the Architect of any discrepancies in part numbers or quantities before bid. Failing to provide such notification requires Contractor to supply items and quantities according to the intent of the Specifications and associated Drawings without claim for additional payment.
D. Obtain all permits necessary for the execution of any work pertaining to the installation, or any operation by the Owner including any associated charges or fees.
E. Execute all work in accordance with all Standard Authorities listed above, and all applicable State and Local codes, ordinances, and regulations. If a conflict develops between the contract document and the appropriate codes and is reported to the Architect prior to bid opening, the Architect will prepare the necessary clarification. Where a conflict is reported after contract award, propose a resolution of the conflict and, upon approval, perform work.
F. Flame proofing and Documentation of Drapery Fabrics:
    1. Provide inherently flame retardant or chemically flame proofed draperies. Chemical flame proofing formula and process must adhere to Bureau of Standards U.S. Department of Commerce. Once fabric is processed, it will pass such tests as are required by the Fire Marshall of the local fire department, the Owner, and any other authority having jurisdiction.
    2. A certificate for each drape is required to be provided to the Owner. This certificate clearly indicates: the name of the Stage Drapery (sub) Supplier, the name and color of the fabric, the name of the Company providing flame proofing treatment, date of the treatment, the date of re-treatment required, the name of the chemical and method used, the signature of an officer or approved representative of the Company providing flame proofing treatment, and the signature of an officer of the company installing the draperies. Official seal(s) and signature(s) of a notary public is required for the both signatures.
    3. Labels clearly indicating date of manufacture, cloth type, manufacturer's name and address, size (width and height using 3/4" minimum lettering), and Owner's designated inventory number (to be coordinated with Owner) will be sewn into the back (in most cases, upstage) side of the upper hem at both ends of each drape panel.

1.8 QUALITY ASSURANCE

A. Stage Curtain Contractor’s Qualifications: Firm experienced in the provision of systems similar in complexity to those required for this project; and meet the following:
    1. No less than five years experience with equipment and systems of the specified types under the same business name.
    2. Experience with at least five comparable scale projects within the last two years.
    3. Employ only fully trained stage riggers and mechanics for the erection of the stage equipment.
    4. The stage riggers will be completely familiar with the type of equipment to be installed. A competent and knowledgeable Job Superintendent will be on the job at all times when work is in progress.
    5. Maintain a fully staffed and equipped service facility.
    6. Contractor shall attend pre-installation meetings to coordinate with other trades as required.

1.9 PRE-INSTALLATION SUBMITTALS

A. The submittal information required by the specification is to be presented complete and as submissions noted below. Submittals are a crucial and integral part of the construction process; as such the Owner's consultant will not recommend payment to the Contractor above 25% of the scheduled value of this work until all submittal information has been approved. Cost for the Owner's consultant to review secondary and re-submittals due to the Contractor's failure to include all required submittal information, or rejection of incomplete or improperly prepared submittal information will be the responsibility of the Contractor. The cost shall be based on the hourly rates of the Architect and Architect’s Consultants as published in their current professional fees schedules and shall also include reimbursable costs for delivery, mailing, and photocopies at direct cost plus ten percent (10%).
B. Project Submittal Part 1:
    1. Provide for approval not later than thirty (30) days after issuance of Notice to Proceed and prior to commencement of Work:
        a. Section 1: A complete schedule of submittals.

b. Section 2: A chronological schedule of Work in bar chart form. Revise and resubmit schedule as required to reflect construction progress.

C. Project Submittal Part 2:
1. Provide for approval no later than sixty (60) days after issuance of notice to proceed and in accordance with previously submitted submittal schedule.
   a. Section 1: Complete list of product to be incorporated within the Work.
   b. Section 2: Manufacturer's data sheets for each product. Provide original manufacturer's data sheets in order as they appear in the specification. These data sheets are submitted for each product in sufficient detail to facilitate proper evaluation to the products suitability for incorporation within the Work.
   c. Section 3: Fabric Samples. Submit a sample book of each fabric specified, containing manufacturer's standard colors available in the quality of fabric specified for the Owner's selection and approval of color. More than one color may be selected. After selection, upon request, submit one square foot sample of each fabric in each color for final review.
   d. Section 4: Submit Material Safety Data Sheets (MSDS) for each potentially hazardous material prior to use. Include information pertaining to the hazardous material with the MSDS.
2. Drawings:
3. Provide computer software generated drawings using standard industry graphic standards. Hand or poorly drawn documents will not be accepted. All drawings shall be created on a computer aided drawing (CAD) system compatible with AutoCAD release 2013. Electronic files of theatrical rigging contract documents shall not be distributed for use in generating submittal documents with the exception of architectural backgrounds.
4. Provide complete assembly details of drapes including stitching schematics, weights, attachment details, and fabric/drape schedule.
5. General Detail Drawings. Provide detail drawings depicting any unique installation methods specific to each product.
6. Any other pertinent data generated which is necessary to provide the Work

D. Submittal Format:
1. Electronic submittals in PDF are required for review.
2. Provide each submittal file with a label reflecting the project title and submittal number.
3. Provide each submittal with a complete table of contents with the following information:
   a. Project title and number.
   b. Submittal number. In the case of a re-submittal, use the original submittal number immediately followed by the suffix "R" immediately followed by a unique number and be numbered in consecutive order.
   c. Date of submission.
   d. Referenced addendum or change-order number as applicable.
   e. Referenced specification Section, Part, Article, Paragraph and page number or drawing reference as applicable.
   f. Index Product Data sheets by manufacturer and model or part number.
4. Separate major grouping with labels.
5. Arrange product data list in alpha-numeric order when applicable followed by unspecified product arrange by manufacturer and model or part number. Follow list by manufacturer's data sheets, arranged in the same order. If a data sheet shows more than one product, indicate the model being proposed with an arrow or other appropriate symbol.
6. Drawings executed at an appropriate scale, not smaller than ⅛" = 1'-0" for conduit/floor plans, ¼" = 1'-0" for equipment layouts, and ½" = 1'-0" for mounting details and plate/panel details.

E. Submittal Copies:
1. These requirements represent minimum project requirements; a project's general conditions may require additional copies for project distribution.
2. Electronic submission of submittals is required.

F. Resubmission Requirements:
1. Make any requested corrections or change in submittals required. Resubmit for review until no exceptions are taken.
2. Indicate any changes that have been made other than those requested.

G. Approval of Submittals: The submittal information will be reviewed by the general contractor, owner, Architects, engineers, and consultant. Each submittal package will be returned, stamped as follows:
1. "No Exceptions Taken" proceed with construction, all job site coordination will be at the direction of the general contractor.

2. "Make Corrections Noted: No Resubmission Required" submittals have been returned with conditional approval. Corrections, as indicated on the returned drawings and/or specifications, must be made before construction can begin.
3. "Make Corrections Noted: Submit Corrected Copy" submittals have been returned with conditional approval. Corrections, as indicated on the returned drawings and/or specifications, must be made in writing and returned to the consultant before construction can begin.
4. "REJECTED, Submit Specified Item" a specified item in the submittal has been rejected for the reasons noted. Re-submit in compliance with the specifications.
5. "REJECTED, Revise and Re-submit" submittal has been rejected for the reasons noted. Re-submit in compliance with the specifications.
6. "No Review Action Required" all information provided was for information or coordination purposes only. Review is not required.

1.10 PROJECT RECORD MANUAL

A. Submit three bound original sets (this is a minimum of two for the Owner and one for the Architect's consultant; additional copies may be required by the project's general conditions) after substantial completion and prior to final inspection.
B. The Project Record Manual shall be segregated into three separate bindings as follows:
   1. Operations Manual.
   2. Product Data: Product actually incorporated within the Work:
      a. Manufacturer's data for each type of product conforming to the scheme above. The list shall include manufacturer's serial numbers.
      b. Owner/Instruction Manual for each product.
      c. For custom circuits or modifications, a description of the purpose, capabilities, and operation of each item.
      d. Manufacturer's wiring diagram for each type of product actually incorporated.
      e. Separately bound list by manufacturer and model or part number of all products incorporated within the Work arranged in alphanumeric order.
   3. Record drawings: Final rendition of that specified depicting what is actually incorporated within the Work. Provide one (1) full size set and one (1) DVD-ROM containing all CAD generated drawings prepared in conjunction with this project. Drawing files to be in AutoCAD Release 2013 DWG format.
   4. Test Reports: Recorded findings of testing specification of this specification.
   5. System Operation and Instructions: Prepare a complete and typical procedure for the operation of the equipment as a system, organized by subsystem or activity.
      a. This procedure should describe the operation of all system capabilities.
      b. Assume the intended reader of the manual to be technically experienced but unfamiliar with the components and the facility.
   6. Service & Maintenance Manual:
      a. Provide an original copy of the service manual on every piece of equipment for which the manufacturer offers a service manual. Arrange manuals in the same order as the operations manual.
      b. Manufacturer's maintenance and care instructions.
      c. Maintenance Instructions, including maintenance phone number(s) and hours; maintenance schedule; description of products recommended or provided for maintenance purposes, and instructions for the proper use of these products.
      d. Replacement parts list of all minor equipment such as fuses, lamps, connectors, knobs, etc.
   7. Warranty Manual:
      a. Manufacturer's warranty statements on each product.
      b. Date of substantial completion and ending dates for warranties for each group of products.
      c. Software registration and licenses.
   8. Drapery Flame proofing Documentation:
      a. Provide all certificates, test reports, and documentation required for drapery flame proofing.
C. Include any other pertinent data generated during the Project or required for future service.
D. Appropriately duplicate data within the separate bindings when it will reasonably clarify procedures, e.g., operational data in maintenance binding.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Ship product in its original container, to prevent damaging or entrance of foreign matter.
B. Handling and shipping in accordance with manufacturer's recommendation.
C. Provide protective covering during construction, to prevent damaging or entrance of foreign matter.
D. Replace at no expense to Owner, product damaged during storage, handling or the course of construction.

1.12 PROJECT CONDITIONS

A. Verify conditions on the job site applicable to this work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.

B. The Drawings diagrammatically show arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install work as shown, recommend solutions and/or submit drawings to the Architect for approval, showing how the work may be installed.

1.13 FINAL INSPECTION AND TESTING

A. Upon completion of installation, initial adjustments, tests and measurements specified in Part 3, and submission and review of the results, a final inspection and test will be observed by the Architect and/or Architect's Consultant no earlier than two weeks after receipt of the written results.

B. Provide a minimum of one (1) person for inspection and two (2) persons for testing familiar with aspects of the System to assist the Owner.

C. The process of testing the System may necessitate moving and adjusting certain components such as counterweights on arbors, adjustment of drapery tracks, etc.

D. Testing includes operation of each major system and any other components deemed necessary. Perform tests and provide required test equipment, tools and material required to make any necessary repairs, corrections, or adjustments.

E. The following procedures will be performed on each System:
   1. Inspection of the methods and means employed to incorporate the System within the facility.
   2. Verification of proper operation.
   3. Verification of proper adjustment, balance, and alignment of equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings for each setting, and appropriately record these settings within the Record Documents.
   4. Other tests on equipment or systems deemed appropriate.

F. In the event the need for further adjustment or work becomes evident during testing, the Contractor is to continue work until the System is acceptable at no addition to the contract price. If approval is delayed because of defective equipment, or failure of equipment or installation to meet the requirements of these specifications and any extension of the inspection and testing period is required, the contract price will be reduced for the additional time and expenses of the Owner, at the standard rate in effect at that time.

G. Contractor shall return to the jobsite six months after acceptance to
   1. Inspect curtains and attachments
   2. Re-trim all curtains.

1.14 WARRANTY

A. Warrant labor and product for two (2) years following the date of substantial completion to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics. Repair or replace defects occurring in labor or product within the Warranty period without charge. Any cost required to complete this warranty repair is the responsibility of the contractor.

B. This warranty is in addition to any specific warranties issued by manufacturers for greater periods of time.

C. Within the warranty period, answer service calls within eight hours, and correct the deficiency within twenty-four hours.

1.15 INSTRUCTION OF OWNER PERSONNEL

A. After final completion, provide instruction to Owner and/or the Owner's designated personnel on the maintenance and care of the Stage Drapery.
   1. Develop training course based on the use of the System and manufacturers' recommendation. Provide one (1) hour of training. All training shall be scheduled at the convenience of the owner and designated personnel.
   2. Submit an outline of the course with sample instructional aids for approval thirty days (30) prior to scheduled instruction sessions.

B. If a representative of the manufacturer is used in the instructional course, the Contractor must be present throughout the extent of the course and ensure that the representative abides by the requirements set forth in these specifications.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Model name and number for manufacturers included in this specification are listed to establish a standard of product quality.

B. Substitution of specified products with other qualified manufacturers and products will be considered providing:
   1. Proper substitution procedures outline under Division 1 is adhered to.
   2. A request for substitution of each specific product must be made in writing by a bidding Contractor not less than ten (10) business days prior to bid for written approval of the Architect.
   3. Sufficient data of the products is presented for prior approval including technical data, manufacturer's specifications, samples, and, if requested, results of independent testing laboratory tests.
   4. Written permission is obtained for the substitution from the Owner or Owner's Representative.
C. If proposed system includes equipment other than specified model numbers, submit a list of major items and their quantities, with a one-line schematic diagram for review. Include a list of previously installed projects using proposed equipment that are similar in nature to specified System.
D. Provide product not specifically specified commensurate with the quality and standards established by the specified product.

2.2 GENERAL

A. Products shall be new, free from defects and listed by UL when an applicable UL Standard exists. Provide product of a given type from one manufacturer.
B. Regardless of the length or completeness of the descriptive paragraph herein, provide product complying with the specified manufacturers' published specifications.

2.3 CONTACTS

A. Listed below is contact information for Manufacturer's of rigging components approved to provide equipment on this project:
   1. K-M Fabrics
      a. 2 Waco Street, Greenville, South Carolina 29611
      b. Telephone: (800) 845-1896
      c. Approved to supply stage drapery fabric.
   2. J.B. Martin
      a. 445 rue St-Jean-sur-Richelieu, Quebec, Canada J3B 2M1
      b. Telephone: (514) 346-6853
      c. Approved to supply stage drapery fabric.
   3. Rose Brand Fabrics
      a. 4 Emerson Lane, Secaucus, NJ 07094
      b. Telephone: (800) 223-1624
      c. Approved to supply stage drapery, hampers and miscellaneous associated equipment.
   4. Liba Fabrics Corp.
      a. 132 W 36th St. 6th Floor, New York, NY 10018
      b. Telephone: (212) 563-4991
      c. Approved to supply curtain fabrics

2.4 STAGE DRAPERY

A. General Specification for Stage Drapery

   1. Provide and install all curtains as located and scheduled on the drawings.
   2. Field verify all dimensions prior to fabrication of draperies.
   3. Curtain fabric of professional grade fabric intended for stage use. If not inherently flame retardant, curtain fabric shall be chemically flame proofed at the mill using an immersion process. Flame proofing certificates for all fabrics used shall be furnished to the owner with the as-built drawings.
   4. Sew tags identifying manufacturer and size of panel at each end of webbing at top and at one corner at hem in each drape.
   5. Curtains must be constructed with vertical seams unless otherwise specified. The fabric grain shall run nap down and match in all panels. All panels must be un-spliced along their height.
   6. Construction
      a. Black Poly webbing at 3" wide shall be double stitched to the top of the curtain with 1" of face fabric turned under the webbing.
      b. Brass rustproof grommets shall be inserted
         1) at the extreme top corners
         2) in the pleat centers of curtains sewn with fullness, or
         3) on 12" centers for flat curtains.

c. Grommet holes for track mounted curtains shall be supplied with
   1) plated wire “S” hooks, or
   2) snap hooks, sewn-in at the spacing noted above.
d. Drapery hung directly from an auxiliary batten shall have a 24” long black cotton tie line fastened in each grommet hole.
e. The centerline of the drape shall be marked on the top webbing with “CL” and a white tie line added to the corresponding grommet.
f. Curtains sewn with fullness shall have box pleats spaced 12” on center.
g. Bottom hems shall be 4” wide. These shall be sewn with a separate canvas chain pocket inside so that the bottom of the canvas pocket rides 2 inches above bottom of the hem. Provide #8 plated jack chain in the pocket.
h. Side hems
   1) All traveling curtains shall be sewn with a minimum 24” of face fabric turned back at the leading edge, unless otherwise scheduled.
   2) All legs and traveling masking curtains shall be sewn with a minimum of 12” of face fabric turn back on both side hems, unless otherwise scheduled.
   3) All other hems shall be 2”, unless otherwise scheduled.

7. Use mercerized cotton thread, minimum weight of #16, color to match drape fabric.
8. Fabric colors shall be as scheduled. Submit color sample card with submittal documents. Make all effort to ensure that curtains of the same color are fabricated from fabrics of the same dye lot.
9. Labeling
   a. Sew labels onto the back (in most cases, upstage) side of the upper hem at both ends of each panel.
   b. Curtain must have NFPA 701 flameproof certification tag sewn on the bottom of each curtain panel for Fire Inspection reference. This label should have permanent stitching around all four sides.
   c. Labels shall clearly indicate
      1) date of manufacture
      2) cloth type
      3) manufacturer's name and address
      4) size (width and height using 3/4" minimum lettering
      5) owner's designated inventory number
10. Acceptable products:
   a. For nominal 25-ounce fabric
      1) KM Fabrics Charisma inherently flameproof velour
      2) Liba Fabrics Charm inherently flameproof velour
      3) Provide custom colors selected by Architect where scheduled.
   b. For nominal 21-ounce fabric
      1) KM Fabrics Encore inherently flameproof velour
      2) Liba Fabrics Velour inherently flameproof velour
   c. For Cyclorama
      1) Rose Brand FR bleached white heavy-weight seamless muslin
      2) Liba Fabrics FR bleached white heavy weight seamless muslin

2.5 COMPLETED SYSTEM

A. General
1. All installation of stage rigging equipment shall be completed utilizing new materials, free from flaws and rust, and in good working order. The jobsite shall be cleaned of all packing materials, lubricants, metal shaving, miscellaneous hardware, and components not used in the installation.
2. All dimensions are to be field verified. Location and attachment of hardware and size of components shall be confirmed by the stage rigging Contractor.
3. All electrical power, outlets, related systems, and structural elements required to make the system fully functional are the responsibility of the contractor.

B. Trimming/Leveling of Drapery
1. Contractor is to return to the jobsite within sixty (60) days, but not less than thirty (30) days of the installation to re-trim all tracks and curtains.
2. Provide documented notes on site visit to Architect and Architect’s Consultants on adjustments made during return visit

PART 3 - EXECUTION

A. GENERAL

1. Coordinate incorporation of the Work specified herein with other project work so as to facilitate a cohesive final product.
2. Mount equipment and enclosures plumb and level.
3. Permanently installed equipment to be firmly and safely held in place in accordance with specified safety factors and Federal and State codes and regulations.
4. Work shall be completed within industry guidelines, including, Entertainment Services and Technology Association (ESTA), OSHA, National Electric Code, American National Standards Institute, American Society for Testing and Materials, American Institute of Steel Construction, National Fire Protection Association, National Electrical Manufacturers Association, plus any or all local, governmental, or other applicable codes.
5. Where dimensions and loading capacities have been omitted from this specification, they are to be determined by the theatre rigging contractor, in accordance with the accepted industry standards and guidelines in this section. In no way will the theatre rigging contractor be relieved of primary responsibility to provide a safe, fully functional system.
6. The mechanical fabrication and workmanship will incorporate the best practices for good fit and finish. There will not be any burrs or sharp edges to cause a hazard nor will there be any sharp corners accessible to personnel.
7. All equipment will be installed based on the manufacturer's recommendations and for the use intended by the manufacturer.
8. All finishes which are disturbed during shipping and installation will be touched up to match the original.

B. INSTALLATION OF STAGE DRAPES AND TRACKS
1. Install all track mounted drapery to hardware according to track manufacturer’s recommendations.
2. Stage draperies shall be installed near the end of the installation when chances of damage from other work are reduced. Stage area shall be broom clean with no further construction taking place prior to installation.
3. After hanging stage draperies, thoroughly brush to remove dust, visible dirt, loose threads, loose fabric lint, etc. Wrinkles will be allowed to fall out naturally.
4. Verify that each drapery panel bears a label as described in paragraph 2.4., A, 9 above.

END OF SECTION 11 61 43

SECTION 11 61 62 – THEATRICAL LIGHTING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY
- A. Provision of the Theatrical Lighting Systems at the Auditorium and Black Box.

1.2 RELATED DOCUMENTS
- A. Theatre Lighting Systems Drawings (“TL” Series) and general provisions of the contract including general and supplementary conditions and Division 1 Specification sections apply to this section.
- B. Section 11 61 33: Theatrical Rigging Systems, drawings, and documentation.
- C. Section 27 41 15: Audio-Visual Systems and Equipment, drawings, and documentation.
- D. Division 26: Electrical Work drawings and documentation.

1.3 SECTION INCLUDES
- A. Project instructions for the Contractor and System description details.
- B. System product descriptions.
- C. Project completion instructions for the Contractor.

1.4 RESPONSIBILITY AND RELATED WORK
- A. Coordination, supply, installation, shipping, storage, inspection, commissioning, testing, instruction and warranties of the Theatrical Lighting Systems.
- B. Plant, materials, equipment, transport and labor necessary to accomplish this and have a complete and fully functioning System.
- C. Also includes:
  1. Required licenses and permits including payment of charges and fees.
  2. Verification of dimensions and conditions at the job site.
  3. Provision of submissions.
  4. Installation in accordance with the Contract Documents, Manufacturer's recommendation, and in conformity with applicable codes and authority having jurisdiction.
  5. Extension of electrical service, including ground, to equipment locations.
- D. The drawings included with this specification convey general system concepts. Where the plans do not show complete and accurate building details, the Contractor is responsible for making field measurements necessary to establish exact locations, relationships, and load capacities necessary for the installation of these systems.
- E. Coordinate the work with the related documents and the scheduled work of other trades.
- F. Conduit infrastructure system, including wire for AC Power and grounding for the Theatrical Lighting Systems, are provided as part of the Contract. Coordination between different disciplines is required to achieve a proper conduit system installation and power provisions for Theatrical Lighting Systems. All electrical installation shall be in accordance with Division 26.
- G. Supply accessories and minor equipment items needed for a complete and fully operational system, even if not specifically mentioned in these Specifications or on the associated Drawings, without claim for additional payment.
- H. Notify the Architect of any discrepancies in part numbers or quantities before bid. Failing to provide such notification requires the Contractor to supply items and quantities according to the intent of the Specifications and associated Drawings without claim for additional payment.
- I. Specifications and drawings are complementary. Work called for by one is binding as if called for by both. Any discrepancies between specifications and drawings shall be brought to the attention of the Architect for clarification during the bidding period. No allowance shall subsequently be made to the Contractor by reason of their failure to have brought said discrepancies to the attention of the Architect.
- J. Execute all work in accordance with the NEC and all applicable State and Local codes, ordinances, and regulations.
- K. If a conflict develops between the Contract Documents and the appropriate codes and is reported to the Architect prior to bid opening, the Architect will prepare the necessary clarification. Where a conflict is reported after contract award, propose a resolution of the conflict and, upon approval, perform work.

1.5 REFERENCES
- A. Published specification standards, tests or recommended methods of trade, industry or governmental organizations apply to Work in this section where cited below:
  1. American National Standards Institute (ANSI)
  2. American Society of Testing and Materials (ASTM)

3. Electronics Industries Association (EIA)
4. Institute of Electrical and Electronic Engineers (IEEE)
5. National Electrical Manufacturer's Association (NEMA)
6. National Electrical Code (NEC)
7. National Fire Protection Association (NFPA)
8. Underwriters Laboratories (UL)
9. Occupational Safety and Health Administration (OSHA)
10. Entertainment Services and Technology Association (ESTA)
11. United States Institute of Theater Technology (USITT)
12. Illuminating Engineering Society (IES)

1.6 DEFINITIONS

A. In addition to Division 1 definitions, the following list of terms as used in this Section shall be defined as:
1. Owner – Fort Bend Independent School District
2. Project – Willowridge High School Renovations and Additions
3. Consultant(s) – WJHW
4. Architect – Kirksey
5. Contractor – The provider of all material, labor, and equipment necessary for the systems described in this Section
6. Furnish/Supply – To purchase, procure, acquire, and deliver complete with all necessary accessories (CWANA)
7. Install – To set in place, join, attach, link, set up or otherwise connect together and test until complete before turning over to the Owner, all parts, item, or equipment supplied by the contractor.
8. Provide – To furnish and install

1.7 DESCRIPTIONS AND REQUIREMENTS

A. Auditorium
1. Provide production lighting control console and accessories.
2. Provide stage edge safety light and controls.
3. Provide new theatrical lighting power distribution system and data network for production lighting and architectural lighting control.
4. Provide new architectural lighting control processor and house lighting panels throughout the venue.
5. Provide new LED production lighting fixtures, cables, and accessories.

B. Black Box
1. Provide new theatrical lighting power distribution system and data network for production lighting and architectural lighting control.
2. Provide new architectural lighting control processor and house lighting panels throughout the venue.
3. Provide production lighting control console and accessories.
4. Provide new LED production lighting fixtures, cables, and accessories.

C. Focus
1. Contractor will hang, focus, and program lights to an Owner directed plot
2. The Owner may elect to generate their own plot. If not, the Consultant will provide this documentation.
3. If the Contractor finds any needed updates or changes before hang begins the Consultant or Owner will update the documents as needed.
4. The Contractor is responsible for tracking and updating all changes to the plot after it has been turned over for installation. These updates and changes may be provided to the Consultant as necessary. However, the Contractor is responsible for these updates and may be provided the plot in an editable format to make the updates.
5. The Consultant produced plot will provide the following information if applicable for each fixture:
   a. Location
   b. Unit number for that location
   c. Type
   d. Area/purpose
   e. Mode
   f. Fixture universe/address
6. As part of turnover documents, the Contractor will be required to ensure the following are provided:
   a. An electronic version of the plot. Provided on a flash drive and preserved by the Contractor for at least the length of the warranty.

b. A B-sized version of the plot mounted to foamcore-like material.
c. All of the information listed above in number 5 and additionally all circuiting of fixtures.

7. As part of the final observation and testing (3.5) Consultant will verify the focus. The Contractor may elect to complete the focus before the final observation and make any changes noted by the Consultant at this time. If the Contractor elects to have the Consultant direct focus as part of final observation the following shall be provided:
   a. At least (10) days notice
   b. A board operator
   c. At least (2) people to perform the focus
   d. All required lifts and safety equipment
   e. A focus target. Person or figure
   f. Person or system to document any changes that arise as part of the focus

D. Console Programming
1. The Contractor shall create a starting show file for the project. The file will be loaded onto the console, provided to the Owner on a flash drive, and preserved by the Contractor for at least the length of the warranty. The Contractor will provide the starting show file to the Owner, if requested, following the requirements laid out in the warranty portion (1.14) of this specification and shall be considered a service call.
2. Owner may select to add, update, or change any of the information below. These changes may be directed before, during, or after initial training. The Contractor will make any requested changes provided any amount of training time is left in the project as outlined in the instruction of Owner personnel of this specification (3.6).
3. At the Owner's request program any fixture, color, or controllable attribute to provided faders.
4. Ensure all areas outlined in the console programming portion of this specification are covered as part of the instruction of Owner personnel of this specification (3.6).
5. Using the provided plot, the Contractor shall create the following console programming at a minimum, if applicable:
   a. Patching
   b. Patch all fixtures to channel numbers outlined in the plot.
6. Groups
   a. (1) group for every area of the plot.
   b. (1) group for every "row" of front lights
   c. (1) group for every "row" of front lights from the left
   d. (1) group for every "row" of front lights from the right
   e. (1) group for every "row" of top lights
   f. (1) group for every "row" of backlights
   g. (1) group for the cyclorama lights
7. Palettes
   a. Intensity
      1) Provide a 70% intensity for use in creating cues
   b. Color
      1) Provide warm (R02) and cool (R3202 or R60) for ease of selection.
      2) Provide a red (R27), green (R90), and blue (R80) for use on cyclorama fixtures
      3) A warm white. Roughly 3200K
8. Interactive Control Display (Magic Sheet)
   a. Provide an interactive control display to aid in programming and console use
   b. The interactive display shall utilize a combination of standard and user-defined symbols to generate a fixture layout which copies the light plot as closely as reasonably possible.
   c. Selectable fixtures will, at a minimum, indicate the following parameters or palettes and their current states:
      1) Fixture type
      2) Channel
      3) Intensity
      4) Color
      5) Focus
   d. Provide controls for all groups as described above

1.8 QUALITY ASSURANCE

A. Contractor's Qualifications: Firm experienced in the provision of systems similar in complexity to those required for this project; and meet the following:
1. No less than five (5) years of experience with equipment and systems of the specified types.

2. Experience with at least five (5) comparable scale projects within the last two (2) years.
3. Engage the services of a Manufacturer certified technician.
4. Be a franchised dealer and service facility for the manufacturer's products furnished.
5. Maintain a fully staffed and equipped service facility.
6. At the request of the Architect, demonstrate that:
    a. Adequate plant and equipment are available to complete the work.
    b. Adequate staff with commensurate technical experience is available.

B. Manufacturer's Qualifications:
1. No less than five (5) years continuous experience in the production of specified type of product.
2. Production shall meet applicable NEMA standards.

1.9 SUBMITTALS:

A. Provide submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures section unless otherwise indicated.

B. The submittal information required by the specification is to be presented complete and as submissions noted below. Submittals are a crucial and integral part of the construction process; as such the Owner's consultant will not recommend payment to the Contractor above 25% of the scheduled value of this work until all submittal information has been approved.

C. Submittals must be original work produced by the firm responsible for performing the work defined in this specification. Scanning, photographic copying, materially copying, or any other reproducing the contents of the drawings or specifications contained within the Contract Documents will be marked as unacceptable and not reviewed for any content. No claim shall be made for delay, undue burden, or additional costs for the effort to produce shop drawings, schedules, and equipment lists addressing this specification or the overall project manual.

D. Project Submittal Part 1:
1. Provide for approval not later than thirty (30) days after issuance of Notice to Proceed and prior to commencement of Work:
    a. Section 1: A complete schedule of submittals.
    b. Section 2: A chronological schedule of Work in bar chart form. Revise and resubmit schedule as required to reflect construction progress.

E. Project Submittal Part 2:
1. Provide for approval no later than sixty (60) days after issuance of Notice to Proceed and in accordance with previously submitted submittal schedule.
2. Products:
    a. Section 1: Complete list of products to be incorporated within the Work (Bill of Materials).
    b. Section 2: Manufacturer's data sheets for each product.
        1) Provide original manufacturer's data sheets in order as they appear in the specification.
        2) Data sheets are required for each product in sufficient detail to evaluate product suitability for incorporation within the Work.
        3) Product literature shall include documentation of UL Listing or approved recognition by a Nationally Recognized Testing Laboratory (NRTL).
    c. Section 3: Provide Architect and/or Architect's Consultant with samples of wall plate materials and colors as specified in this section.
    d. Section 4: Submit Safety Data Sheets (SDS) for each potentially hazardous material prior to use. Include information pertaining to the hazardous material with the SDS.
3. Drawings:
    a. Provide computer software generated drawings using standard industry graphic standards. Hand or poorly drawn documents will not be accepted. All drawings shall be created on a computer aided drafting (CAD) system. Electronic files of theatrical lighting contract documents shall not be distributed for use in generating submittal documents with the exception of Architectural backgrounds.
    b. Schematic Drawings.
        1) Provide drawings detailing cabling-riser intent.
        2) Give each component a unique designator and use this designator consistently throughout the project.
        3) Include inter- and intra-component connections and cabling diagram depicting cable types, designators, and color codes.
    c. Installation Drawings.
        1) Provide drawings showing the coordinated locations of all installed equipment. Drawings shall include floorplans and other views as necessary to fully describe the intended finished conditions.

2) Provide Conduit and Electrical Drawings indicating:
   a) Conduit sizing/routing for each system component,
   b) Locations where power is required along with the location of all junction boxes.
3) Detail Drawings: Provide drawings showing special details depicting methods and means specific to each product, assembly and each product Manufacturer's recommended installation methods and means.

d. Equipment Drawings:
1) Rack and Panel Elevations: Provide a front elevation of all racks and/or panels.
2) Rack and Panel Assembly Details: Provide drawings showing location of equipment in racks with dimensions; wire routing and cabling within housings; AC power outlet and terminal strip locations.
3) Custom Enclosures and Millwork Drawings: Provide full fabrication detail drawings indicating size, material, finish, and openings for equipment.
4) Fabricated Plates and Panels Drawings: Provide complete drawings of custom fabricated plates or panels. Drawings to include dimensioned locations of components, component types, engraving information, plate material and color, and bill of material.

e. Schedule Drawings: Provide load schedules noting source and destination of wiring and associated connected load.
f. Labeling Drawing: Provide representative equipment and cabling labeling scheme. Include font sizes and styles, explanation of scheme, and descriptor and designator schedule.
g. General Detail Drawings: Provide detail drawings depicting any unique installation methods specific to each product.
h. Control Screen Templates: Provide layout drawings and/or screenshots for master house lighting stations and similar electronic control surfaces.

4. Any other pertinent data generated which is necessary to provide the Work.

F. Submittal Format:
1. Electronic (PDF) submittal documents are required for review.
2. Provide each submittal with a unique number and each shall be numbered in consecutive order.
3. Submittals shall not be issued with other disciplines.
4. Provide each submittal with a complete table of contents with the following information:
   a. Project Name
   b. Submittal number. In the case of a resubmittal, use the original submittal number immediately followed by the suffix "R" immediately followed by a unique number and shall be numbered in consecutive order.
   c. Date of submission.
   d. Referenced specification Section, Part, Article, Paragraph, and page number or drawing reference as applicable.
5. Follow list by Manufacturer's data sheets, arranged as in Part 2 of this specification. If a data sheet shows more than one product, indicate the model being proposed with an arrow or other appropriate symbol.
6. Drawings executed at an appropriate scale, but not smaller than 1/8" = 1'-0".

G. Resubmission Requirements:
1. Make any requested corrections or change in submittals required. Resubmit for review as directed.
2. Indicate any changes that have been made other than those requested.
3. Approval of Submittals: Each submittal package will be returned with one of the following stamps:
   a. "No Exceptions Taken" proceed with construction; all job site coordination will be at the direction of the General Contractor.
   b. "Make Corrections Noted: No Resubmission Required" submittals have been returned with conditional approval. Corrections, as indicated on the returned drawings and/or specifications, must be made before construction can begin.
   c. "Make Corrections Noted: Submit Only Corrected Pages/Items" submittals have been returned with conditional approval. Corrections, as indicated on the returned drawings and/or specifications, must be made in writing and returned to the consultant before construction can begin.
   d. "REJECTED, Submit Specified Item" a specified item in the submittal has been rejected for the reasons noted. Re-submit in compliance with the specifications.
   e. "REJECTED, Revise and Re-submit" submittal has been rejected for the reasons noted. Re-submit in compliance with the specifications.
   f. "No Review Action Required" all information provided was for information or coordination purposes only. Review is not required.

4. Any of the above stamps may also carry a “PARTIAL” stamp. This indicates that required information noted in the section above was not provided. Omitted items may be noted as part of the reviewed submittal, but it is the Contractor’s responsibility to verify all required submittal documentation.

1.10 PROJECT RECORD MANUAL

A. Provide electronic copies of the project record documents or as required per the General Conditions of the Project.

B. The Project Record Manual shall be segregated into three separate bindings as follows:
   1. As-Built Record Documents:
      a. Product Data:
         1) List of all products incorporated in the Project inclusive of all substitutions, field changes, or revisions The list shall include Manufacturer’s serial numbers.
         2) Manufacturer's data for each type of product conforming to the scheme above.
         3) Organize and bind the above in specification order.
      b. Record drawings: Final rendition of project drawings enumerated in the Submittal section above. Provide editable computer software generated drawings using standard industry graphic standards. Hand or poorly drawn documents will not be accepted. All drawings shall be created on a computer aided drafting (CAD) system, in both a DWG and PDF file format.
      c. Test Reports: Record findings of systems testing described in Part 3 below.
   2. Operations Manual
      a. System Operation and Instructions: Prepare a complete and typical procedure for the operation of the equipment as a system, organized by subsystem or activity.
         1) This procedure should describe the operation of all system capabilities.
         2) Assume the intended reader of the manual to be technically experienced but unfamiliar with the components and the facility.
   3. Service & Maintenance Manual:
      a. Provide an original copy of the service manual on every piece of equipment for which the Manufacturer offers a service manual. Arrange manuals in the same order as the operations manual.
      b. Manufacturer’s maintenance and care instructions.
      c. Maintenance Instructions: include maintenance phone number(s) and hours, maintenance schedule, description of products recommended or provided for maintenance purposes, and instructions for the proper use of these products.
   4. Warranty Manual:
      a. Manufacturer's warranty statements on each product.
      b. Date of substantial completion and ending dates for warranties for each group of products.
      c. Software registration and licenses.
   5. Include any other pertinent data generated during the Project or required for future service.
   6. Appropriately duplicate data within the separate bindings when it will reasonably clarify procedures, e.g., operational data in maintenance binding.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Products shall ship and be stored in their original container to prevent damaging or entrance of foreign matter.

B. Provide protective covering during construction to prevent damaging or entrance of foreign matter.

C. Replace, at no expense to Owner, product damaged during storage, handling, or the course of construction.

1.12 PROJECT CONDITIONS

A. Verify conditions on the job site applicable to this work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.

B. The Drawings diagrammatically show cabling and arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install work as shown, recommend solutions and/or submit drawings to the Architect for approval, showing how the work may be installed.

1.13 FINAL TESTING AND OBSERVATION

A. Upon completion of installation and initial tests and adjustments specified in Part 3, acceptance testing shall be performed by the Consultant.

B. The process of acceptance testing the System may necessitate moving and adjusting certain component parts; perform such adjustments without claim for additional payment.

1.14 WARRANTY

A. Warrant labor and product for two (2) years following the date of substantial completion to be free of defects and deficiencies and to conform to the drawings and specifications as to kind, quality, function, and characteristics. Repair or replace defects occurring in labor or product within the Warranty period without charge. Any cost associated with this warranty repair is the responsibility of the Contractor.
B. This warranty is in addition to any specific warranties issued by Manufacturers for greater periods of time.
C. Within the warranty period, answer service calls within twenty-four (24) hours during normal working hours and correct the deficiency within forty-eight (48) hours.
D. During the warranty period, the Manufacturer shall provide a toll-free 24-hour-per-day number for telephone technical support and service request. If callback is required, calls shall be answered within thirty (30) minutes.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Model numbers and manufacturers included in this specification are listed to establish a standard of product function, performance, and quality. Products or manufacturers listed herein are listed in no particular order or preference.
B. Refer to General and Supplementary Conditions and Division 1 Specification Sections for equipment substitution procedure. Substitution of any equipment within this specification shall require review and approval by WJHW.
C. Substitution of specified products with other qualified manufacturers and products will be considered providing:
D. A request for substitution of each specific product must be made in writing by a bidding Contractor not less than ten (10) business days prior to bid for written approval of the Architect.
E. Sufficient data of the products is presented for prior approval including technical data, manufacturer's specifications, samples, and, if requested, results of independent testing laboratory tests.
F. Written permission is obtained for the substitution from the Owner or Owner's Representative.
G. Providing product not specifically specified without prior written approval by the Owner, Architect, and/or Architect's Consultant shall not be accepted.

2.2 GENERAL

A. Products shall be new, free from defects and listed by an NRTL when an applicable NRTL Standard exists. Provide product of a given type from one manufacturer.
B. Provide product of a given type from one manufacturer.
C. Regardless of the length or completeness of the descriptive paragraph herein, provide product complying with the specified manufacturers' published specifications.

2.3 CABLING AND ACCESSORIES

A. All cable shall be compliant with NEC and NRTL listed. Any NRTL listing must be available at the time of bid.
B. All electrical conductors installed under this contract, except where otherwise specified, shall be soft drawn annealed stranded copper having a conductivity of not less than 98% of pure copper, and meet appropriate ratings (e.g., CMR, CMP, etc.)
C. Cable shall carry appropriate fire rating (e.g., CMR, CMP, OFNR, OFNP, etc.) on jacket of cable.
D. Where cables are routed through cable tray, provide tray rated cable of equal specification.
E. Where cables are run exposed through a return air plenum, provide plenum rated cable of equal specification.
F. Shielded cables located in raceways shall have aluminum foil shield with drain wire.
G. The Belden cables listed below are approved for use on this project and are listed to set the acceptable standard of performance. If field conditions or actual cable pathway requires tray or plenum cable, provide version of cable that meets required rating. Cables from Carol, Liberty, and West Penn are also acceptable provided they meet the performance specifications of the approved listed cables.
H. DMX512 (E-DMX) distribution cable:
    1. Provide 24 AWG four twisted pair data cable.
    2. Pair Color Code Chart:
        a. 1 – White/Blue Stripe and Blue
        b. 2 – White/Orange Stripe and Orange

c. 3 – White/Green Stripe and Green
d. 4 – White/Brown Stripe and Brown
3. Insulation: Polyolefin
4. Inner/Outer Jacket Material: PVC – Polyvinyl Chloride
5. Nominal Impedance: 100 ohms.
6. Nominal Velocity of Prop.: 72%
7. Capacitance between conductors: 15.0 pF/ft.
8. Acceptable product:
a. Belden 1583A (Category 5E).

I. DMX512 (E-DMX) distribution cable – Stage Electric Drops:
1. Provide extra rugged, flexible control cable (Ethernet) for connection of NET outlets on grid to electric batten distribution.
2. Cable to be four-pair, double shielded, low-capacitance.
3. Conductors: 26 AWG tinned, annealed copper stranded 7 x 0.16.
4. Connector: Provide with EtherCon connector by Neutrik®.
5. Assembly: pairs cabled with Kevlar strength member.
6. Shield: (inner) aluminum/Mylar, 100% coverage (outer) tinned copper braid, 80% coverage.
7. Conductivity: 15ohms per 100 meters @ 20C.
8. Impedance: 100 ± 15 ohms 1-100MHz.
9. Acceptable product:
a. TMB & Associates ProPlex or equivalent.

J. DMX512 Backup Control Signal Distribution Cable:
1. Provide 24 AWG two twisted pair cable.
2. Insulation: Foam polyethylene.
3. Shield: aluminum foil/polyester tape.
4. Capacitance between conductors: 12.5 pF/ft.
5. Acceptable product:
a. Belden 9729

K. Architectural Lighting DMX Cable:
1. Provide 24 AWG two twisted pair cable.
2. Insulation: Foam polyethylene.
3. Shield: aluminum foil/polyester tape.
4. Capacitance between conductors: 12.5 pF/ft.
5. Acceptable product:
a. Belden 9842

L. Preset Station Signal Distribution Cable:
1. Provide 16 AWG single twisted pair cable.
2. Insulation: PVC-polyvinyl chloride.
3. Shield: unshielded.
4. Capacitance between conductors: 33 pF/ft.
5. Acceptable product:
a. Belden 8471

M. Multi-Conductor SO Type Cable:
1. Provide multi-conductor cable with black neoprene jacket.
2. Conductivity: not less than 98%.
3. Conductor: soft drawn annealed stranded copper.
4. Minimum Conductor Temperature: 90° C.
5. Size: No. 12 AWG minimum.
6. No. of Conductors: As required by circuits shown.
7. Acceptable product:
a. Cole Wire & Cable
b. Carol
c. Rome

2.4 POWER DISTRIBUTION

A. Wall-Mounted Motorized Breaker Panels (MBP)
1. General
a. Breaker Panels shall be UL Listed,
b. Breaker Panels shall consist of a main enclosure with 12, 24, or 48 pole breaker subpanels, integral control electronics for low voltage terminations and provision for accessory cards
c. The panel shall be constructed of 16-gauge galvanized steel. All panel components shall be properly treated or finished in fine-textured, scratch resistant paint

d. The unit shall provide interior cover over the control electronics and accessory cards to allow access only to class 2 wiring and prevent direct access to class 1 line voltage components
e. Circuits as described in schedule
f. Breakers shall provide manual switching control while power is unavailable

2. Each panel shall have a keypad and LCD display for rack configuration, backup, and fault indication.
3. Panels shall employ USITT DMX-512 control format.
4. An Ethernet connection shall provide advanced control of relays over streaming ACN (sACN) and transmit status, control override, and measured energy usage per branch circuit via an internal Web UI or central monitoring interface
5. The panel shall have a UL924-listed contact input for use in Emergency Lighting systems.
6. Electrical
   a. Breaker Panels shall be available to support power input from:
      1) 120/208V three phase 4-wire plus ground
   b. Breaker panels shall support main circuit breaker options:
   c. As required for functional system based on existing electrical service or Division 26 documents
7. Breaker Panel Accessories
   a. A low voltage 0-10V dimming option shall provide up to 24 0-10v control outputs that are linked to relay circuits within the panel. Each output shall support up to 400mA of current sink per output
   b. A contact input option shall provide 24 dry contact inputs to be linked for direct or group relay control, to activate a preset, or to activate a sequence. Controller software shall allow for normally open maintained, normally closed maintained, or momentary toggle
8. Provide with main lug only option.
9. Quantity: As shown in drawings
10. Acceptable Product
    a. Electronic Theatre Controls – Sensor IQ Panel
    b. Lyntec - LCP Series Lighting Control Panelboards
    c. Vari-lite – RigSwitch+ Performance Power Platform

B. Mini Relay Panel (ERP)
1. Provide a small-format DMX controlled relay panel for load circuit distribution as described on the drawings.
2. Mechanical
   a. Panel shall be constructed of 16AWG steel and finished in a black fine-texture powder paint.
   b. Panel shall support wall and ceiling mounting, including installation in plenum air return spaces.
   c. A removable dead front cover shall be mechanically fastened using four screws.
   d. An internal safety cover made of 16AWG steel shall prevent access to all line voltage (Class 1) wiring and components without limiting access to low voltage terminations, changing settings during commissioning, or manual control of relays.
3. Functionality
   a. Panel shall be available in both (4) and (8) zone configurations with a 20A, fully–rated, relay output and 0-10V dimming output per zone.
   b. Panel shall be UL924 LISTED for emergency lighting circuits and shall activate only the selected outputs. Excluded loads shall be shed and not output during emergency conditions
   c. Panel shall support onboard configuration without the use of software.
   d. Panel shall support a contact input for use in UL 924 Emergency Systems
   e. A dry contact input shall provide triggering of an emergency condition
   f. A three-position switch shall set the input as Normally Open (NO) Normally Closed (NC), or Off.
   g. Panels shall be configurable via ANSI E1.20 Remote Device Management (RDM). RDM parameters shall include: Panels that are not configurable over RDM shall not be acceptable.

C. Distribution Wiring Devices
1. General
   a. All power distribution devices overall assembly shall be listed by a nationally recognized test lab.

b. All dimmed circuit connectors shall be 20A grounded stage pin type. All switched circuits connectors shall be 20A stage pin type. All connector types provided shall be of a single manufacture.
c. All pigtails shall be three-wire type “SOW” rubber jackets cable. All pigtails to be provided with proper strain relief.
d. All power distribution devices shall be fabricated from minimum 18-gauge galvanized steel and finished in black fine-textured powder coat paint unless noted otherwise. Boxes shall be free from burrs, sharp corner, and overhanging edges.
e. Circuits for Raceways and Plugging Boxes shall be labelled with 2” yellow on black Brady numbers. Numbers shall be located so that they are not obscured by cabling. Circuits shall be assigned and labelled per schedules on drawings.
f. Circuits for Wall Boxes and Floor Pockets shall be labelled with 1” yellow on black Brady numbers. Numbers shall be located so that they are not obscured by cabling. Circuits shall be assigned and labelled per schedules on drawings. As a rule, circuits shall number Stage Left to Stage Right, Down stage to Upstage.
g. All power distribution devices shall be provided with appropriate mounting hardware.
h. All multi-conductor cable is to be provided with Kellems-type strain relief grips at each end of the cables with intermediate strain relief as required.
i. Provide connector strips, gridiron junction boxes (GIJB), and associated hardware for over the stage lighting. Coordinate connector strip lengths for electrics with the theatrical rigging equipment. Provide all multi-conductor cables allowing the devices to fly to a low trim as indicated on the TR sheets. The cable is to be provided with necessary cable strain relief grips as part of the cable management system. Provide rugged network control cables to parallel the multi-conductor cable runs. Verify all electrical circuits and label all circuit numbers as specified.

2. Wall Mounted Boxes (WB)
   a. Provide a wall plug-box designed for recessed mounting.
   b. Construction: code gauge steel.
   c. Connectors: female 20 Ampere stage pin connectors surface mounted in the plug-box.
   d. Circuits: number of circuits as specified on drawings.
   e. Labeling: circuits are labeled with yellow letters on black background.
   f. Overall assembly UL listed.
   g. Quantity: As shown in drawings.
   h. Acceptable product:
      1) Altman 450 series
      2) ETC 9200 series
      3) SSRC RM series
3. Pipe Mounted Boxes (PB)
   a. Provide a plug box designed for pipe mounting.
   b. Construction: code gauge steel.
   c. Pigtails: SO type cable. Provide lengths as shown on drawings.
   d. Connectors: female 20A stage-pin connectors on the end of each of the pigtails and flush mounted 20A parallel blade receptacles for convenience circuits.
   e. Circuits: number of circuits as specified on drawings.
   f. Labeling: circuits are labeled with yellow letters on black background.
   g. Overall assembly UL listed.
   h. Quantity: As shown in drawings.
   i. Acceptable product:
      1) Altman 450 series
      2) ETC 9300 series
      3) SSRC PM series
      4) ETC 8500 series
4. Gridiron Junction Boxes (GJB)
   a. Provide a junction box designed to mount to the structure above.
   b. Construction: 16-gauge, cold rolled steel with removable covers.
   c. Size: minimum 18”W X 6”H X 12”D with four mounting holes. Box will be provided to properly to accommodate number of circuits specified on drawings.
   d. Finish: fine-texture, scratch resistant, black-powder coating.
   e. Termination: barriered, screw clamp type terminal strip(s). Terminals to be sized for the circuit, according to the circuit amperage as required.
   f. Grounding: junction box will have grounding lugs.
   g. Up to two (2) GIJBs may be required per stage electric; reference circuit count per drawings.

h. Overall assembly UL listed.
i. Provide Kellems-type grips for each multi-conductor cable entering the junction box.
j. Acceptable product:
1) Altman GJB series
2) ETC 8700 series
3) SSRC GB series

5. Distribution Raceway (R)
a. Provide a connector strip style connector device designed for mounting to pipe battens. Unit is to have a barrier strip for use in conjunction with control network distribution.
b. Construction: 16-gauge, cold-rolled steel with removable covers.
c. Size: approximately 4”X4” in section, provided in lengths as shown on TR drawings.
d. Finish: fine texture, scratch resistant, black powder coat.
e. Bracket: provide (1) steel hanging bracket for every five (5) feet of strip.
f. Pigtails: SO type cable, 18” in length with Heyco strain relief.
g. Connectors: female 20A stage-pin connectors on the end of each of the pigtails and flush mounted 20A parallel blade receptacles for convenience circuits
h. Circuits: number of circuits as specified on drawings with labels on both sides of connector strip.
i. Termination: circuits terminated at a barrier terminal strip in a terminal box located, as specified on drawings.
j. Overall assembly UL listed.
k. Quantity: As shown in drawings
l. Acceptable product:
1) Altman 450 series
2) ETC 9900 series
3) SSRC BAL series

6. SO Cable Cradles
a. Provide properly sized cable cradles for SO cable service from gridiron junction box to plug-strip connector device.
b. Acceptable product:
1) ETC 8800 Series
2) Altman 512 Series.

7. SO Cable Kellems-type Grips
a. Provide properly sized Kellems-type grips for SO cable service from gridiron junction box to plugstrip connector device.
b. Quantity: As required for the specified number of circuits
c. Acceptable product:
1) Hubbell or equivalent.

2.5 CONTROL EQUIPMENT

A. Control Distribution Rack (CDR)
1. The control distribution rack shall be an EIA compliant 19” wall mount rack.
2. Center section and back pan shall be 16 gauge steel, finished in a black textured powder coat.
3. Rack rails shall be constructed of 11 gauge steel with tapped 10-32 mounting holes in universal EIA spacing.
4. Rack height shall be sized to contain all equipment as shown in the contract documents.
5. Rack shall have an overall depth of 22.3.” Useable depth shall be 20,” extending into the back pan 3.5.”
6. Accessories:
a. Provide a Furman M-8Lx type pull out panel light in the rack.
b. Provide one (1) locking storage drawer and all necessary vent or blank panels.
7. The control distribution rack shall be provided by the Lighting Control System Manufacturer.
8. Quantity and details: As shown on drawings
9. Acceptable product:
a. Mid-Atlantic DWR series

B. UPS Backup Power / Surge Protection
1. Provide a rack mountable UPS backup to support equipment located in the control distribution racks (provide with one (1) spare battery).
2. Output Power Capacity: 1400VA/1050W
3. Input 120V/ Output 120V
4. Interface Port: DB-9 RS-232

5. Extended runtime model
6. Rack Height: 2 Units
7. Filtering: Full time multi-pole noise - filtering: 0.3% IEEE surge let-through: zero clamping response time: meets UL 1449
8. The UPS shall be provided by the lighting control system manufacturer.
9. Quantity: As shown in drawings.
10. Acceptable product:
    a. APC
    b. Tripp Lite
    c. Middle Atlantic

C. Control Components
1. Ethernet Switches (ESW)
    a. Provide business grade Gigabit PoE+, Layer 2 managed Ethernet switches in the CDR as shown in the TL series documents.
    b. Switch shall include 24 POE+ ports meeting IEEE802.3at standard
    c. Switch shall include port routing via separate VLAN subnets
    d. Switch shall be equipped with LED indicators for power status, port status, bandwidth utilization, collision detection and speed indication.
    e. Switch shall have a built-in web-based management interface to provide easy to use management through a standard browser. Provide with all required software management tools.
    f. Provide rack mount kit and required hardware and cables for stacking.
    g. Each network location shall have a dedicated input point on the network switch. Dedicated input points shall be clearly labeled to identify connected network device at the patch panel. Patching shall not be required.
    h. Ethernet switch shall be tested and approved by Lighting Control System Manufacturer for compatibility with all connected devices.
    i. Quantity: As required by design
2. Network Node/Gateway
    a. Provide rack-mounted DMX Ethernet node/Gateway to generate DMX to devices located at theatrical and house architectural lighting positions
    b. Nodes shall have (4) screw terminal or 5-pin DMX connectors for a total of 4 DMX universes for distribution over the Ethernet system.
    c. DMX Node shall have LEDs for indication of power, network activity, and DMX port configuration.
    d. Each input shall route directly to the Ethernet Switch located in the assigned Dimmer Rooms without the need for patching.
    e. Quantity: As required by design.
    f. Acceptable product:
        1) Pathway rack-mounted gateway
        2) Vari-lite rack-mounted gateway
        3) ETC rack-mounted gateway
3. eDIN Demultiplexer Module:
    a. Provide a rack mounted DMX to 0-10v signal converter for house lighting as required. Reference Division 26 documents.
    b. Each architectural circuit shall have an independent output by the Demultiplexer; there shall be no daisy chain runs between circuits.
    c. Quantity: As required by Design.
    d. Acceptable product:
        1) Pathway Connectivity #1004 Demultiplexer (DMX-to-Analog)
        2) ETC Response 0-10V Gateway

D. Plates and Devices
1. Network Receptacle Station/Gateway (NET)
    a. Provide a remote plug-in station for connection of control console and portable DMX Gateways at control booth and other locations as noted in the drawings.
    b. Station shall be provided with a Neutrik RJ45 jack. Each jack shall be rated for use in harsh commercial conditions.
    c. Station will contain the following components:
        1) RJ 45 jack with punch down block, provide Neutrik EtherCon type receptacle as indicated on drawings.
        2) Station faceplates shall be .80” aluminum, finished in fine texture, scratch-resistant black powder coat.

3) Station back box will be a minimum of 2.5 inches.
4) Station shall have silk screened graphics white in color.
5) Provide a Lamacoid label that de-notes, using an alpha-numeric labeling convention, the switch location and network port number.

d. These network connections shall also be configured with a back box and mounting hardware for mounting on the FOH lighting galleries or backstage.
e. Each Network jack will route directly to the Ethernet Switch located in the assigned Dimmer Rooms without the need for patching.
f. No daisy chaining between jacks or splicing of Category 5e and above cable is allowed.
g. Quantity: As shown in drawings.
h. Acceptable product:
1) Pathway Network station
2) Vari-lite station
3) SSRC station
4) ETC Network station

2. DMX512 Distribution Box/Network Gateway (NN2):
a. Provide a plug-in box designed for pipe mounting.
b. Node shall provide the quantity of universes, as specified, of DMX512 control for intelligent lighting or other DMX512 addressable devices.
c. Power for the node shall be provided over the Cat6 cable via the network switch. All nodes shall be IEEE 802.3af compliant and UL listed. Power consumption shall not be greater than 3 watts.
d. Ports:
1) DMX Ports shall comply with the requirements of the USITT DMX512.
2) The DMX port shall be software-configurable for either input or output.
3) DMX inputs shall be fully opto-isolated from the node electronics and from each other.
4) DMX outputs shall be earth-ground referenced.
5) DMX Ports shall be capable of withstanding fault voltages of up to 250VAC without damage.
e. Node modules will mount within a standard electrical box or enclosure.
f. Each input shall route directly to the Ethernet Switch located in the assigned Dimmer Rooms without the need for patching.
g. Quantity: As shown in drawings.
h. Acceptable product:
1) Pathway Connectivity Pathport Node
2) Vari-lite Node
3) ETC DMX Node

3. Portable Network Gateways:
a. Provide portable output nodes and input node for pipe mounting at any NET station.
b. Each node shall be equipped with a molded RJ 45 connector on a jacketed cable (see specification for flexible Category 6 cable) for connection to the lighting control network (NET).
c. Node shall provide the quantity of universes, as specified, of DMX512 control for intelligent lighting or other DMX512 addressable devices.
d. Power for the node shall be provided over the Category 6 cable via the network switch. All nodes shall be IEEE 802.3af compliant and UL listed. Power consumption shall not be greater than 3 watts.
e. Ports:
1) DMX Ports shall comply with the requirements of the USITT DMX512.
2) The two DMX ports shall be software-configurable for either input or output.
3) DMX inputs shall be fully opto-isolated from the node electronics and from each other.
4) DMX outputs shall be earth-ground referenced.
5) DMX Ports shall be capable of withstanding fault voltages of up to 250VAC without damage.
f. Double Universe Node shall contain the following components:
1) RJ 45 connector. Connector is to be RJ Lnxx model ENSAM315.
g. Provide C-clamp for pipe mounting.
h. Quantity: (4) Output Nodes and (2) Input Nodes
i. Acceptable product:
1) Pathway Connectivity Pathport Node

2) Vari-lite Node
3) ETC Portable DMX Node

4. DMX512 Distribution (DMX):
   a. Provide DMX512 distribution for connection to wiring devices in the Classroom and Auditorium.
   b. Modules shall provide one optically isolated DMX512 signal output capable of driving thirty-two (32) receiving devices on a single DMX line.
   c. Provide a wall plugging box designed for surface mounting.
   d. Construction: code gauge steel.
   e. Connectors: Neutrik 5 conductor XLR, flush mounted.
   f. Circuits: located as shown on the drawings.
   g. Labeling: labeled with yellow letters on black background.
   h. Quantity: As shown in drawings.
   i. Acceptable product:
      1) Pathway Connectivity station
      2) Vari-lite station
      3) SSRC station
      4) ETC station
5. Control Receptacle Station (CR#)
   a. Provide a flush-mounted control station for connection of the control console over network.
      1) Provide with DMX receptacles as described on the drawings.
   b. Station will contain receptacle components as described on the drawings.
   c. Station faceplates shall be .80” aluminum, finished in fine texture, scratch resistant black powder coat.
   d. Station Back box will be a minimum of 2.5 inches deep
   e. Station shall have white, silk screened graphics
   f. Provide a Lamacoid label for network jacks that denotes, using alpha-numeric labelling convention, the switch location and network port number.
   g. Each network jack shall route directly to the Ethernet switch without the need for patching.
   h. No daisy-chaining between jacks or splicing on network cabling is allowed.
   i. Quantity: As shown in drawings.
   j. Acceptable product:
      1) Pathway Connectivity station
      2) Vari-lite station
      3) SSRC station
      4) ETC station

2.6 CONTROL CONSOLE AND ACCESSORIES

A. Overview
   1. Use the currently installed control console for direct operation of theatrical fixtures and development of user-presets to be stored for recall via the Architectural Control Sub-system specified in this section.
   2. Provide initial setup as directed as part of the system commissioning process.

B. Black Box Control Console
   1. The lighting control console shall be a microprocessor-based system specifically designed to provide complete control of stage, studio, and entertainment lighting systems.
   2. The system shall also be able to control third party ACN devices directly. The system shall provide control of 1,024 or 6,144 outputs on a maximum of 32,768 control channels.
   3. A maximum of 10,000 cues, 999 cue lists, 1000 groups, 1000 presets, 4 x 1000 palettes (Intensity, Focus, Color and Beam), 1000 effects, 1000 macros and 100 curves may be contained in non-volatile electronic memory and stored to an onboard hard disk or to any USB storage device.
   4. The console may be placed in Tracking or Cue Only mode by the user as a system default and overridden on individual record actions as required.
   5. A Master Playback fader pair and dedicated Grand Master/Blackout shall be provided.
   6. A high-resolution level wheel shall be provided to control intensity for selected channels and scrolling within selected displays. Four page-able high-resolution encoders shall be provided for control of other non-intensity parameters. Non-intensity parameters shall be controllable via the encoders or keypad controls, without need of an external pointing device.
   7. Control and programming features for automated fixtures shall also include: a standard library of fixture profiles, the ability to copy and edit existing profiles and create new profiles, patch displays including channel and output addressing, 16-bit fade resolution, color characterization allowing color mixing and storing in Hue and Saturation or native device values.

8. The system shall direct user input through on-screen dynamic prompts and integral LEDs on console keys indicating current operating mode. A context sensitive on-line Help feature shall explain and provide an example of the operation of each feature of the system.
9. A row of softkeys shall be provided, which change function based on the selection and context of the console. These softkeys shall be labeled via an adjacent LCD display that shows their current functions at all times. Systems using softkeys with no LCD display shall not be acceptable.
10. Console software upgrades shall be made by the user via a USB port; changing internal components shall not be required.
11. The console operating software shall be loaded into program execution memory from the internal hard drive when the console is powered. In the event of an uncontrolled shutdown, the console shall return to its last output state when power is restored.
12. Console power shall be 95 – 240V AC at 50 or 60Hz, supplied via a detachable power cord.
13. Accessories:
    a. Provide (2) external touchscreens high resolution DVI monitors that will display system information, including playback status, live output and blind values for all record targets.
    b. Provide (1) fully-functioning, detachable alphanumeric keyboard. The keyboard shall allow labeling of channels, cues, presets, groups, palettes, effects, macros, curves and the show. An integral electronic keyboard shall be provided.
    c. Provide with dust cover
    d. Provide with USB mouse
    e. Provide with 25’ network control cable
    f. Provide (1) Littlite with 3-pin XLR connector
    g. Provide (1) USB jump drive, minimum 8gb
14. Quantity: (1)
15. Acceptable product:
    a. Electronic Theater Controls Element 2 with 6,144 channels of control

C. Auditorium Control Console
1. The lighting control console shall be a microprocessor-based system specifically designed to provide complete control of stage, studio, and entertainment lighting systems.
2. The system shall also be able to control third party ACN devices directly. The system shall provide control of 2,048 or 12,288 outputs on a maximum of 32,768 control channels.
3. A maximum of 10,000 cues, 999 cue lists, 1,000 groups, 1,000 presets, 4 x 1,000 palettes (Intensity, Focus, Color and Beam), 1,000 effects, 1,000 macros and 1,000 curves may be contained in non-volatile electronic memory and stored to an onboard hard disk or to any USB storage device.
4. The console may be placed in Tracking or Cue Only mode by the user as a system default and overridden on individual record actions as required.
5. A Master Playback fader pair and dedicated Grand Master/Blackout shall be provided.
6. Twenty user configurable playback faders shall be built into the console for additional preset, palette, submaster and grand master control.
7. Up to six USB fader wings may be connected to the console, for a maximum of 300 submasters and/or 200 playback faders. USB fader wings may be rigidly connected to the main console to provide a "single connected unit" with no external cables required. The wings also may be connected via USB cables and used "on the side."
8. A high-resolution level wheel shall be provided to control intensity for selected channels and scrolling within selected displays. Four page-able high-resolution encoders shall be provided for control of other non-intensity parameters. Non-intensity parameters shall be controllable via the encoders or keypad controls, without need of an external pointing device.
9. Rotary encoders for non-intensity parameters shall be labeled by means of an integral LCD display mounted above or below the encoders on the main console. The display shall show the currently loaded functions of the encoders based on the current selections. Systems using encoders with no LCD labeling shall not be acceptable.
10. Control and programming features for automated fixtures shall also include: a standard library of fixture profiles, the ability to copy and edit existing profiles and create new profiles, patch displays including channel and output addressing, 16-bit fade resolution, color characterization allowing color mixing and storing in Hue and Saturation or native device values.
11. The system shall direct user input through on-screen dynamic prompts and integral LEDs on console keys indicating current operating mode. A context sensitive on-line Help feature shall explain and provide an example of the operation of each feature of the system.
12. A row of softkeys shall be provided, which change function based on the selection and context of the console. These softkeys shall be labeled via an adjacent LCD display that shows their current functions at all times. Systems using softkeys with no LCD display shall not be acceptable.

13. Console software upgrades shall be made by the user via a USB port; changing internal components shall not be required.
14. The console operating software shall be loaded into program execution memory from the internal hard drive when the console is powered. In the event of an uncontrolled shutdown, the console shall return to its last output state when power is restored.
15. Console power shall be 95 – 240V AC at 50 or 60Hz, supplied via a detachable power cord.
16. Accessories:
    a. Provide (2) external touch screen high resolution DisplayPort (DP) monitors that will display system information, including playback status, live output and blind values for all record targets.
    b. Provide (1) fully-functioning, detachable alphanumeric keyboard. The keyboard shall allow labeling of channels, cues, presets, groups, palettes, effects, macros, curves and the show. An integral electronic keyboard shall be provided.
    c. Provide console client software kit
    d. Provide with dust cover
    e. Provide with USB mouse
    f. Provide with 25’ network cable
    g. Provide (1) Littlite with 3-pin XLR connector
    h. Provide (1) USB jump drive, minimum 8gb
17. Quantity: (1)
18. Acceptable product:
    a. Electronic Theater Controls ION XE 20 with 2,048 channels of control.

D. Auditorium Handheld Remote Focus
1. The portable access unit shall be a wired or wireless remote-control device that allows access to console programming and playback functions.
2. The device shall be an 8-inch tablet with a capacitive multi-touch display.
3. Remote unit shall connect through an RJ45 and wirelessly via a WAP
4. Contractor shall provide WAP that meets District standards for WiFi function and security
5. Contractor shall provide the following accessories:
    a. Charging/cable Adaptor
    b. Hand Strap.
    c. Shoulder Strap
    d. EETI Stylus Pen
    e. Office Dock
    f. VESA Dock
6. Acceptable product:
    a. Electronic Theatre Controls ETCpad

2.7 ARCHITECTURAL CONTROL SYSTEM

A. Processing – Provide either a rack mounted control processor located in the control distribution rack or provide distributed processing at each control station.
1. The processing rack shall receive output data from a lighting control console and/or architectural control stations, process the information it receives and distribute the information to DMX-controlled panels and devices.
2. Processing Racks shall be designed to support the following wire terminations:
    a. AC (single phase)
    b. Echelon link power
    c. 24Vdc
    d. DMX512 In
    e. DMX512 Out
    f. RS232 Serial In/Out
    g. Net3 Unshielded Twisted Pair (UTP) or ST fiber optic
3. Coordinate integration of audio-visual system with contractor and program system as directed by the End User.

B. Configuration – Configure architectural control system screens in conjunction with User prior to commissioning. Base configuration shall accommodate the following basic layouts:
1. Main Navigation
2. User configurable named presets (2 pages to be programmed at training)
3. House light individual control
4. House light presets
5. Work light individual control
6. Work light presets

7. Blue light individual control
8. Blue light presets

C. Stations - General
1. Master stations shall be located in the control booth, backstage and as noted on the contract documents.
2. Provide preset stations as described below and shown in drawings.
3. All audience exposed switches shall be provided with locking covers and shall be painted a custom color as determined by the architect.

D. Acceptable product:
1. Electronic Theatre Controls Paradigm System with Ern
   a. Provide with Response Snapback
2. Vari-lite Vision.net
3. Interactive Technologies CueServer3 Pro

E. House Lighting Fixture Control
1. Contractor shall be responsible for installation and termination of DMX and/or 0-10v to all architectural house light fixtures. It is the Contractor's responsibility to verify operation on ground before fixtures are permanently installed. Any required DMX and/or 0-10v controlled interface shall be provided by the Contractor including equipment parts, labor and installation of equipment.

F. Control Stations/Receptacles
1. House Light Master Station (HLM)
   a. Provide full color 7" LCD touchscreen master station.
   b. Station shall be wall mounted or rack mounted as shown on drawings
   c. Station finish shall be black in technical areas and color selected by Architect for public spaces.
   d. Station shall be configurable with system software via USB, serial data and Network interface
   e. Station shall have the ability to store multiple configurations with the User being able to select which is active.
   f. Station shall accommodate individual zone control, preset record and selection function.
   g. Station shall be able to lock out preset stations located in the facility.
   h. Master station shall have local control for each work light, house lights, running lights and other settings as required by the Owner.
   i. Quantity: As shown on the drawings.
   j. Acceptable product:
      1) Electronic Theatre Controls – Unison Paradigm touchscreen station
      2) Vari-lite – Vision.net touchscreen station
      3) Interactive Technologies – CueServer3 Pro Insite touchscreen station
2. SMP Rack Panel (SMP)
   a. Provide standard 19" panel to be mounted in SMP rack provided under 27 41 16
   b. Panel shall contain the following:
      1) House Light Master touchscreen station (HLM)
      2) (2) Neutrik RJ-45 network receptacle (NET)
      3) Network labels as required
      4) On/Off switch for Stage Edge Safety Light power supply
   c. Coordinate panel size and material type to match AV components in the SMP rack.
3. Portable House Light Master Station
   a. Provide a portable house light master station as specified above with a clam-type protective cover that also functions as a stand.
   b. Provide with 25' detachable connection cable.
   c. Quantity: (1)
   d. Acceptable product:
      1) Electronic Theatre Controls – Unison Paradigm handheld touchscreen
      2) Vari-lite – Vision.net portable touchscreen station
      3) Interactive Technologies – CueServer3 Pro Insite touchscreen station
4. Push Button Preset Stations (HL2)
   a. Provide two, five and ten push button stations as shown on drawings
   b. Stations shall be mounted within a one-gang back box
   c. Station finish shall be black in technical areas color selected by Architect for public spaces.
   d. Two button stations (HL2) shall be programmed for on/off operation with on button being a fully programmable preset

e. Five button stations (HL5) shall have four programmable presets plus off. Presets may include house lights, work lights, blue lighting and will be programmed with the User.
f. Quantity: As shown on the drawings.
g. Acceptable product:
1) Electronic Theatre Control Unison Heritage
2) Vari-lite Vision.net
3) Interactive Technologies Ultra Stations

2.8 EMERGENCY LIGHTING EQUIPMENT
A. Emergency DMX Bypass Control (EDB)
1. Provide a bypass means to trigger special-purpose lighting presets and bypass normal lighting controls during emergency or panic situations
2. The Emergency DMX Bypass shall be capable of overriding a single universe of ANSI E1.11–2008, USITT DMX512-A control signals from “Normal” to “Bypass” when a trigger signal is detected.
3. The DMX Emergency Bypass Controller shall poll the bypass trigger input after a power loss and react upon start up.
4. The default or recorded sequence shall be recalled immediately on restart if the trigger is also applied at restart.
5. The Emergency DMX Bypass enclosure shall provide discrete high and low voltage wiring compartments with voltage barrier.
6. The Emergency DMX Bypass shall have a LED indicator visible from the exterior of the enclosure.
7. The Emergency DMX Bypass shall be UL Section 924 Listed for interaction with similarly listed products.
8. Quantity: As shown on drawings.
9. Acceptable product:
a. Electronic Theatre Controls DMX Emergency Bypass Controller
b. Vari-lite DMX Bypass
B. Phase Loss Monitor (PLM)
1. Provide a means to detect the loss of normal power and trigger special-purpose lighting presets.
2. Phase Loss Monitor enclosures shall support 100V to 277V configurations
3. E Phase Loss Monitor enclosures shall be field configurable for single-phase, bi-phase, and three-phase operation without the need for additional components.
4. The Phase Loss Monitor shall be completely pre-wired by the manufacturer. The contractor shall provide input feed and control wiring.
5. All control wire connections shall be terminated via factory provided connectors.
6. The Phase Loss Monitor shall be UL and Section 924 Listed for interaction with similarly listed dimming and switching panels.
7. Quantity: As shown on drawings.
8. Acceptable product:
a. ETC Emergency Bypass Detection Kit
b. Vari-lite Phase Loss Sense Panel

2.9 MISCELLANEOUS
A. Stage Edge Safety Light
1. Lamp: SKL Square Krystal-Lite (waterproofed) on 6" spacing
2. Bulb Type: Red, white at the center
3. Housing: SC Channel; .41" profile, "U" channel for inlayed/surface design - field verify all dimensions.
4. Coordinate installation with Electrical.
5. Transformer: Provide appropriately sized transformer for custom length. Stage edge light to be controlled through the dimming system, provide any DMX interface as needed.
6. Ensure control interconnectivity to orchestra pit as needed. Stage edge should switch between fixtures based on pit location automatically.
7. Overall assembly is to be UL listed.
8. Quantity: (1) As shown on drawings
9. Acceptable Product:
a. Vista Light Strip (with SKL lamps)
b. Future-Light Edge Light
c. Tivoli Stage Edge
B. LED Stage Electric Work Lights
1. Provide a high output LED work light capable of clamping onto the top batten of the stage electrics.

2. Construction: Heavy duty anodized extruded aluminum housing. All materials shall be corrosion resistant.
3. Rating: 120/240 volts AC/DC operation.
4. Cable: 36” Teflon leads encased in black fiberglass sleeving.
5. Connectors: (1) male parallel blade
6. Yoke: Rigid flat steel with locking dog tilt handle.
7. Finish: All black enamel
8. Provide with yoke and c-clamp hardware
9. Quantity: (8)
10. Acceptable product:
    a. Altman LED Work Light
    b. SSRC LED Work Light, 150W Warm White

C. Rolling Safety Light
1. Provide castered stand with safety caged compact fluorescent 100 watt equivalent lamp.
2. Provide (1) 30’ 12/3 cable terminating in a 20A U-ground connector. Mount cable hanger to stand.
3. Quantity: (1) Custom Safety Light
4. Acceptable product(s):
    a. Altman 526/5-9 with listed accessories

2.10 PORTABLE LIGHTING FIXTURES AND ACCESSORIES

A. Provide and integrate the following equipment into the project.
1. Theatrical Lighting Fixtures
    a. The portable lighting fixtures shall connect and be controlled by the new theatrical lighting control system.
    b. All fixtures shall be listed by UL or an OSHA approved NRTL.
    c. Fixtures shall be constructed of rugged die cast aluminum with high impact knobs and handles unless otherwise noted.
    d. Fixtures shall be provided with a black finish unless otherwise noted.
    e. Fixtures shall have a rugged steel yoke with a positive locking clutch which will allow for a 300º body rotation.
    f. All fixtures shall be provided with color frame, power lead with mating grounded connector, safety cable, and c-clamp.
    g. Fixtures shall be:
        1) Labeled with the Owner’s mark and select numbering/labelling inventory scheme.
        2) Bench-focused, if necessary.
        3) Hung in the Owner’s selected stock plot.
        4) Patched at the console.

B. LED-type fixtures
1. Provide (1) power pass-through and (1) DMX extension cable at 10 ft. length for each LED-type fixture included in the inventory. All cables shall adhere to requirements set for below in Cables and Accessories portion of this specification.
2. All LED-type fixtures shall support ANSI E1.11 DMX512-A and ANSI E1.20 RDM standards.
3. All LEDs used in the product shall be high brightness and proven quality from established and reputable LED manufacturers.
4. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.

C. Fixtures – Type and Quantity
1. Type A1 – High Intensity Color-changing LED Profile
    a. Provide a six (6) color mixing high-intensity LED illuminator with DMX controlled intensity and color;
    b. Unit shall have a shutter assembly with (4) blades mounted in two or more planes. Shutter blades shall be warp and burnout resistant;
    c. Unit shall have two accessory slots, a top-mounted quick release gel frame retainer, and a slot with sliding cover for motorized pattern devices or optional iris.
    d. Unit shall have projector-like quality pattern imaging, sharp shutter cuts without halation, and allow for both hard and soft beam edges;
    e. Unit shall operate at 100V to 240V 50/60 Hz and utilize an internal power supply;
    f. Provide power lead with stage pin connector
    g. Unit shall support power and DMX in and thru connections.
    h. Provide the following quantity of high-definition lens tubes:
        1) (10) 14°;
        2) (12) 19°;

3) (10) 26°;
i. Quantity: (32)
j. Acceptable product:
1) ETC Source Four LED Series 2 Lustr (black) complete with EDLT lens tube
2) VL600 Acclaim PLE+
3) Chauvet Ovation Reve E-3

2. Type A2– Color-changing LED Profile - Auditorium
a. Provide an RGBL color mixing high-intensity LED illuminator with DMX controlled intensity and color;
b. Unit shall have a shutter assembly with (4) blades mounted in two or more planes. Shutter blades shall be warp and burnout resistant;
c. Unit shall have two accessory slots, a top-mounted quick release gel frame retainer, and a slot with sliding cover for motorized pattern devices or optional iris.
d. Unit shall have projector-like quality pattern imaging, sharp shutter cuts without halation, and allow for both hard and soft beam edges;
e. Unit shall operate at 100V to 240V 50/60 Hz and utilize an internal power supply;
f. Provide power lead with stage-pin connector;
g. Unit shall support power and DMX in and thru connections.
h. Provide the following quantity of high-definition lens tubes:
1) (08) 14°;
2) (08) 19°;
3) (08) 26°;
4) (06) 36°;
i. Quantity: (30)
j. Acceptable product:
1) ETC ColorSource Spot V complete with EDLT lens tube
2) Vari-lite LED PLE

3. Type A3 – Color-changing LED Wash - Auditorium
a. Provide an RGBL color mixing high-intensity LED illuminator with DMX-controlled intensity and color;
b. Unit shall have an accessory slot with a top-mounted quick-release gel frame retainer.
c. Unit shall operate at 100V to 240V 50/60 Hz and utilize an internal power supply.
d. Provide power lead with stage-pin connector;
e. Unit shall support power and DMX in and thru connections.
f. Provide (6) barn door assemblies and floor-stand yokes with base.
g. Quantity (30)
h. Acceptable product:
1) ETC ColorSource Fresnel V
2) Vari-lite Acclaim LED Fresnel
3) Chauvet Ovation F-915FC

4. Type A4 – LED Cyclorama Fixture - Auditorium
a. Provide a four (9) color mixing high-intensity LED illuminator with DMX controlled intensity and color;
b. Unit shall operate at 100V to 240V 50/60 Hz and utilize an internal power supply;
c. Provide power lead with stage-pin connector;
d. Unit shall support power and DMX in and thru connections;
e. Provide trunnion with c-clamps hanging bracket mounting for each fixture if manufacturer does not provide yoke-mounting hardware;
f. Acceptable product and quantity:
1) Vari-lite CODA LED Cyc (9).
2) Altman Cyc 200 LED RGBA (9);
3) Chauvet Ovation CYC 3 FC (9).

5. Type A5 – LED Follow Spots - Auditorium
a. Provide a 6000K cool white high-intensity LED illuminator with DMX controlled intensity.
b. Construction: sheet metal housing with black finish. All materials will be corrosion resistant.
c. Rating: Long life LED source
d. High performance quartz condenser optical system.
e. 100% closing iris with black plate follower in a removable cassette.

f. Built in flicker free power supply.
g. "A" size double gobo holder on slide changer.
h. 6-way boomerang color changer fitted with removable filter frames.
   1) Provide the boomerang loaded with gels selected by Owner. These gels will be provided separately from any allotment of gels within this specification.
i. Heavy duty adjustable yoke.
j. Heavy duty stand
k. Special hanging points at the rear of the unit.
l. Set of tools and first emergency spare parts.
m. Quantity: (2)
n. Acceptable Products:
   1) Robert Juliat –Tristan
   2) Altman AFS-700

6. Type B1 – Color-changing LED Zoom-style Profile – Black Box
   a. Provide an RGBL color mixing high-intensity LED illuminator with DMX-controlled intensity and color;
   b. Unit shall have a shutter assembly with (4) blades mounted in two or more planes. Shutter blades shall be warp and burnout resistant;
   c. Unit shall have two accessory slots, a top-mounted quick-release gel frame retainer, and a slot with a sliding cover for motorized pattern devices or optional iris.
   d. Unit shall have projector-like quality pattern imaging, sharp shutter cuts without halation, and allow for both hard and soft beam edges;
   e. Unit shall operate at 100V to 240V 50/60 Hz and utilize an internal power supply;
   f. Provide power lead with stage-pin connector;
   g. Unit shall support power and DMX in and thru connections;
   h. Unit shall utilize an integral 25º -50º adjustable lens assembly;
   i. Quantity: (22)
   j. Acceptable product:
      1) ETC ColorSource Spot jr Deep Blue
      2) Vari-lite Acclaim LED Zoomspot
      3) Chauvet Ovation E2-FC

7. Type B2 – Black Box Color-changing LED Wash – Black Box
   a. Provide an RGBL color mixing high-intensity LED illuminator with DMX controlled intensity and color;
   b. Unit shall have an accessory slot with a top-mounted quick release gel frame retainer.
   c. Unit shall operate at 100V to 240V 50/60 Hz and utilize an internal power supply.
   d. Provide power lead with stage-pin connector;
   e. Unit shall support power and DMX in and thru connections.
   f. Provide one (1) NSP, MFL, and WFL round field lens with each fixture.
   g. Quantity (18)
   h. Acceptable product:
      1) ETC ColorSource PAR Deep Blue
      2) Vari-lite Acclaim LED Fresnel
      3) Chauvet Ovation P-56FC

D. Cables and Accessories
   1. Extension Cables:
      a. Provide extension cables for extending pigtail or wall box circuits to lighting instrument.
      b. Provide cable and connectors which meet or exceed the quality of cables and connectors set forth in this specification.
      c. Provide each cable with Velcro cable tie.
      d. Provide extension cable assemblies consisting of 12-gauge, 3 conductor flexible cable and 20A rated male and female grounded stage-pin connectors.
      e. Quantity:
         1) Auditorium
            a) (16) @ 10 ft.
            b) (08) @ 25 ft.
         2) Black Box
            a) (08) @ 10 ft.
            b) (08) @ 25 ft.

f. Acceptable Products:
   1) Lex Products PowerFLEX
   2) TMB & Associates ProPower
   3) Or approved equal

2. Adapter Cables
   a. Provide adapter cables for extending pigtail or wall box circuits to lighting instrument.
   b. Provide cable and connectors which meet or exceed the quality of cables and connectors set forth in this specification.
   c. Provide each cable with Velcro cable tie.
   d. Provide extension cable assemblies consisting of 12-gauge, 3 conductor flexible cable and 20A rated male Edison connectors and female grounded twist-lock connectors.
   e. Quantity:
      1) (6) @ 1ft. with Male Edison and female twist-lock connectors
      2) (6) @ 1ft. with Male twist-lock and female Edison connectors
   f. Acceptable Products:
      1) TMB & Associates ProPower
      2) Lex Products PowerFLEX
      3) Or approved equal
3. DMX-512 cable
   a. Provide DMX-512 cables for connecting lighting consoles, moving lights, or other DMX controlled accessories to the Network Nodes.
   b. Connectors shall be Neutrik 5-pin.
   c. Provide 24AWG two twisted pair data cable.
   d. Insulation: polyethylene.
   e. Nominal Impedance: 100 ohms.
   f. Nominal Velocity of Prop.: 78%.
   g. Capacitance between conductors: 12.5 pF/ft.
   h. Quantity:
      1) Auditorium
         a) (16) @ 10 ft.
         b) (08) @ 25 ft.
      2) Black Box
         a) (08) @ 10 ft.
         b) (08) @ 25 ft.
   i. Acceptable Products:
      1) TMB & Associates ProPlex
      2) Lex Products PowerFLEX
      3) Or approved equal
4. Flexible Category 5e Cable/NET Cable:
   a. Provide extra rugged, flexible control cable (Ethernet) for connection of NET stations to portable Network Nodes.
   b. Cable to be 4-pair, double shielded, low-capacitance.
   c. Conductors: 24 AWG tinned, annealed copper stranded 7 x 0.16.
   d. Connector: Provide with EtherCon connector by Neutrik
   e. Assembly: pairs cabled with Kevlar strength member.
   f. Shield: (inner) aluminum/Mylar, 100% coverage (outer) tinned copper braid, 80% coverage.
   g. Conductivity: 15ohms per 100 meters @ 20C.
   h. Impedance: 100 ±15 ohms 1-100 MHz
   i. Quantity:
      1) Auditorium
         a) (4) 3’ Ethernet Cable
         b) (4) 10’ Ethernet Cable
         c) (2) 25’ Ethernet Cable
      2) Black Box
         a) (4) 3’ Ethernet Cable
         b) (4) 10’ Ethernet Cable
         c) (2) 25’ Ethernet Cable
   j. Acceptable Products:
      1) TMB & Associates ProPlex
      2) Lex Products PowerFLEX
      3) Or approved equal
5. XLR DMX Terminator

a. Provide XLR DMX male terminator
b. Connector shall be Neutrik 5-pin.
c. Termination resistance: 120 ohms +/- 1et5her0% between pins 2 and 3
d. Termination power capacity: 2 watts
e. Quantity: (18)
f. Acceptable Product
   1) ETC SGE 1507
   2) Lex Products DMX5P-TERM

6. Diffusion Medium Sheets
   a. Provide standard and high temperature (HT) diffusion medium
   b. Provide (24) full size sheets (20”x24”) of HT diffusion medium
   c. Acceptable product:
      1) Rosco Color Filters R119 Light Hamburg Frost
      2) Lee Color Filters 253 Hampshire Frost
7. Pattern Templates (Gobos)
   a. Provide stainless steel image patterns.
   b. Patterns shall be selected by the Owner
   c. Quantity:
      1) (8) size B
      2) (8) size M
   d. Acceptable product(s):
      1) Rosco Stainless Steel Gobos
8. Pattern Template Holders
   a. Provide stainless steel metal pattern holders with plastic pull ring
   b. Quantity:
      1) (8) size B
      2) (8) size M
   c. Acceptable product(s):
      1) City Theatrical 2160 and 2165 sandwich holders
      2) Electronic Theatre Controls 400PH-B and 400PH-M pattern holders
9. Side Arm Extensions
   a. Provide side arms for extending the mounting point of theatrical fixtures beyond rigging pipes and handrails.
   b. Side arm to consist of:
   c. Hanging attachment for connection to 1.5” schedule 40 batten or handrail.
   d. Pipe extension of 18”
   e. One or more sliding tees for attaching theatrical fixtures to pipe extension
   f. Color: black
   g. Quantity: (18)
   h. Acceptable product:
      1) Altman Lighting 509-HD-24-1 Side Arm
10. Tie Line
   a. Product will be a cotton line with polyester core
   b. The blend will be a diamond braid construction
   c. Product will be Black in color
   d. Product will be unglazed
   e. Product will be 1/8” in diameter
   f. Product will be on original spool or reel
   g. Provide 600’-0” spool
      1) Cut into 24” ties for dressing cable used in repertory plot
      2) Furnish the remainder of unused spool to Owner
   h. Quantity: (2)
   i. Acceptable product:
      1) Rose Brand #4 Tie Line
11. Light Trees:
   a. Provide code rated parts to comprise a lighting tree.
   b. Pipe and base will be furnished in black finish.
   c. Provide six (8) light tree assemblies as follows:
   d. Provide a 50lb. base NPT threaded to accept a typical 1-1/2” Schedule 40 pipe.
   e. Provide a 10’-6” section of 1-1/2” Schedule 40 pipe (threaded on both ends) with plastic vinyl end cap.
   f. Provide total three (3) – 18” sliding tee side arms for each tree.

g. Provide total three (3) – 35 pound sandbags for each tree.
h. Acceptable product:
1) Base: Altman B50.
2) Or approved equal

12. Side Arms:
a. Provide total of eighteen (24) – 18” sliding tee side arms (three) for each light tree.
b. Furnished in black finish.
c. Acceptable product:
1) Altman 18in. Sidearm with One Tee
2) Or approved equal

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate incorporation of the Work specified herein with other project work so as to facilitate a cohesive final product.
B. The installation recommendations contained within the Telecommunications Distribution Methods Manual are mandatory minimum standards and requirements.
C. Mount equipment and enclosures plumb and level.
D. Permanently installed equipment to be firmly and safely held in place.
E. Verify all locations of equipment in all rooms with Owner’s Representative, Owner, and Consultant.

3.2 INSTALLATION OF CABLE AND WIRING

A. Verify installation of electrical work for this scope and all associated equipment with the overall Electrical installation. Provide all necessary equipment, including mounting hardware, for complete connection of power system wiring.
B. Verify installation of power and ground wiring to equipment. Power and ground wiring will terminate inside of equipment and/or junction boxes and be hardwired to ground buss and circuit breaker to ensure uninterrupted operation.
C. All control wiring will be executed in adherence to ANSI standards including the following:
1. Isolate cables carrying signals at different levels and separate to restrict interaction.
2. Keep wiring separated into three groups of conduit provided for control circuits, power circuits (up to 50 Amps), and feeder circuits (above 50 Amps).
3. Isolate all wiring, except for safety ground wiring, from conduit ground.
4. Take such precautions as are necessary to prevent and guard against electromagnetic and electrostatic interference in other technical systems (such as sound and communications systems) in the facility. Where possible all devices and wiring will be enclosed in a shielded environment. Take care not to use shields (conduits) and grounds as current carrying return paths for lamp and relay coil commons. All ground references are to be made to the building electrical system ground.
5. Label unused wiring provided for spares or future systems and terminate at screw terminal strips.
6. All joints and connections will be made with resin-core solder or with ratchet jaw crimp type mechanical connectors. Connect all circuits electrically in phase using same wire color code for similar circuits throughout the project.
7. Install cable in a manner to adhere to manufacturer’s specifications for maximum cable pulling tension, minimum bend radius, and restrictions.
8. Provide appropriate support at all horizontal-to-vertical transitions in order to keep the weight of the cable from degrading at the point of transition.
9. If a J-hook or trapeze system is used to support cable bundles, all horizontal cables shall be supported at a maximum of 48-inch (1.2 meter) intervals. At no point shall the cables rest on light fixtures, acoustic ceiling grids, panels, conduits, sprinkler pipe, water pipe and/or HVAC system ducting.
10. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices
11. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, install appropriate carriers to support the cabling.
12. Cables shall be identified by a self-adhesive machine label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.
13. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.

14. Provide splice free wiring and cabling from origination to destination. Cables shall be installed in continuous lengths from origin to destination (no splices). Properly designed transition points, or consolidation points are not considered 'splice' points.
15. Cover edges of cable and wire pass-through holes in chassis, housings, boxes, etc., with rubber grommets or Brady GRNY nylon grommetting.
16. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced prior to final acceptance at no cost to the Owner.

3.3 INSTALLATION OF EQUIPMENT

A. Take appropriate precautions against electrostatic discharge (ESD) when installing electronic equipment.
B. Equipment to be installed in new condition, free of damages, scratches, dents, etc.
C. Provide adequate ventilation in cabinet mounted equipment to maintain operating temperatures within range recommended by Manufacturer.
D. All equipment will be installed in compliance with applicable Local and National Codes and Regulations.
E. Equipment shall be installed in accordance with Manufacturer's requirements.
F. Install lighting fixtures using standard industry practices. All lamps, lenses, and reflectors will be installed free of dirt, dust, and finger smudges. Do not use bare hands when handling conventional tungsten lamps. Ensure that a safety cable is properly applied with each fixture.
G. Install lighting instruments to the standard house hang or repertory plot as directed by Consultant. Contractor shall document location of each type of distribution device and circuiting as part of as-built documents on plot. Provide pdf copy of plot to Consultant and Owner. Provide (2) full size printed copies of plot to Owner.

3.4 CONTRACTOR COMMISSIONING

A. Prior to energizing or testing the System ensure the following:
   1. Physical installation is complete.
   2. Products are installed in proper and safe manner according to Manufacturer's requirements.
   3. Dust, debris, solder splatter, etc. is removed.
   4. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.
   5. Temporary facilities and utilities have been properly disconnected and removed.
   6. Broken work, including glass, raised flooring and supports, ceiling tiles and supports, walls, doors, etc. have been replaced or properly repaired, and debris cleaned up and discarded. The jobsite shall be broom clean.
B. Contractor shall:
   1. Retain the services of a Manufacturer certified technician to check the installation and ensure its proper operation. No part of the Theatrical Lighting System may be energized before this technician has checked and approved the System installation.
   2. Test all lighting load circuits for the following:
      a. Continuity
      b. Nominal voltage
      c. Polarity
      d. Accuracy to the Distribution Schedule as enumerated in the drawings.
   3. Test controls wiring for the following:
      a. Appropriate wire types and quantities
      b. Control wire distance from source
      c. Terminations meet Manufacturer requirements
C. The following identifies some, but not all, of the commissioning tasks of the commissioning team. This list is not intended to be comprehensive and should be considered a general guideline for the Contractor without a defined commissioning process statement:
   1. Program all power distribution panels
   2. Setup and program all network control devices
   3. Setup and initial programming of control console
   4. Setup and initial programming for all architectural control devices
   5. Program all emergency lighting control devices

3.5 FINAL OBSERVATION & TESTING

A. Upon completion of installation, initial adjustments, tests and measurements specified in Part 3, and submission and review of the results, a final inspection and test will be observed by the Consultant.
B. Testing will include operation of each major system and any other components deemed necessary. Contractor will assist in this testing and provide all test equipment noted

below. Contractor shall provide at least two (2) technicians available for the entire testing period (day and night), to assist in tests, adjustments, and final modifications. Testing process is estimated to take a minimum of one (1) day.

C. Provide the following test gear:
   1. Circuit Tester with adapters for all connectors present in the system.
   2. Multimeter capable of measurements up to 600V AC/DC, 10A DC, and 2MOhms
   3. DMX Tester
   4. Industrial Ethernet Tool capable of testing signal continuity and distance from source

D. The following procedures will be performed on each System:
   1. Observation of the physical installation including labeling, mounting, and finish of all equipment and components which are a part of the System.
   2. Functional testing of all control devices and devices under control within the System.
   3. Review of programming and standard settings for all control interface devices.
   4. Load circuit verification.
   5. Control circuit verification.
   6. Other tests on equipment or systems deemed appropriate.

E. The Consultant will provide the Owner with a listing describing any incomplete or otherwise deficient items determined as part of the testing process. Where further adjustment or work becomes evident during testing, the Contractor is to continue work until the System is complete.

3.6 INSTRUCTION OF OWNER PERSONNEL

A. Provide operations and service training on all equipment incorporated in the System.

B. Training shall not be conducted until final observation and testing is completed by the Consultant, unless otherwise directed by the Owner.

C. Provide (12) hours of training. Training time shall be conducted in multiple sessions, with each session not to exceed four hours. Training shall be conducted in accordance with Owner's schedule.
   1. Six months after completion of initial training, schedule an additional (4) hours with Owner for review of systems and equipment operation.

D. The major equipment components and subject matter are as follows (advisory percentage of overall time allocated):
   1. Power Distribution System (20%)
      a. Basic testing and control
      b. Normal and emergency operations
      c. Programming memory
      d. Software configurations and upgrades
      e. Troubleshooting.
   2. Control Console (40%)
      a. Operational training, including offline or remote-access software
      b. Patching and programming
      c. Fixture integration
      d. Peripheral hardware
      e. Applications interface for retrieving information from the control console
      f. Troubleshooting
      g. Upgrades
   3. Architectural Controls (20%)
      a. Part of training will be to establish programmed looks for the performance areas with the end-user. The Contractor shall provide all equipment to establish DMX values for preset looks.
      b. Snapshotting preset onto DMX controller
      c. Preset recall operation
      d. Normal operations (e.g., console arbitration, time-clock controlled events, etc.)
      e. Troubleshooting.
   4. Theatrical Lighting Fixtures and Accessories (20%)
      a. Hang and focus
      b. Cabling and circuiting
      c. Setup and DMX addressing
      d. Troubleshooting

E. Training Schedules
   1. Training should be assumed to take place on the project site.
   2. Training should be scheduled to be non-overlapping.
   3. Actual training schedule shall be by agreement with Owner.

4. In the event that a portion of the training time is occupied in troubleshooting the equipment installation, then the training time shall be extended an equal amount of time.

F. Submit an outline of the course with sample instructional aides for approval thirty (30) days prior to scheduled instruction sessions to architect and architect's consultant.

G. Following discussions with Owner, provide a Training submittal 2-4 weeks prior to first training. Submittal shall:
1. Include a separate page/entry for every training session.
2. Indicate date, time, and approximate length of training session.
3. Indicate person(s) conducting training.
4. Indicate whether training will be video recorded.
5. Intended curriculum and most appropriate attendees (e.g., technician, operations, IT, etc.)
6. Include signature and title lines for:
   a. Owner acknowledging and accepting training schedule. Include both an Accepted and Rejected box. An alternate schedule time should be suggested by the Owner in the event the schedule is rejected.
   b. Countersigning by trainer indicating that training actually occurred.
   c. All persons attending training. Where attendees do not stay for the entire session, this should be noted on the form and initialed by Owner's representative attending training.
   d. Owner's representative attending training at the end of the session shall initial that:
      1) Training Occurred.
      2) Training Materials were provided and left with Owner
      3) Training was not interrupted or shortened by equipment or system troubleshooting. If it is, then there should be a line where Owner and Contractor can indicate when make-up training will be provided and how long it should be.
      4) Training was generally sufficient for the proposed curriculum.
7. Include Notes section for Owner and Contractor to note any issues during training (areas requiring further development, etc.)

H. Following training occurrence, submit completed training records no later than 5 days following end of training. When training is conducted over a period of weeks, completed training submittals shall be consolidated into a single submittal and submitted every 2 weeks.

3.7 EVENT ATTENDANCE

A. Contractor shall attend the first facility use or event as directed by the Owner.
1. Event Attendance includes the following requirements:
   a. Attendance shall begin at the first crew call and conclude when the crew is released. During these events perform such tasks (e.g., assistance with patching, programming, troubleshooting cabling problems, etc.) as requested by User. Tasks shall be strictly assistance, not operation.
   b. Event support personnel shall be a technician associated with the original installation and commissioning.
   c. In the event that the system is used prior to final acceptance, attendance in support of system usage shall not be construed as acceptance or as event attendance.
2. Coordinate these schedules with the Owner.

END OF SECTION 11 61 62

SECTION 12 21 13 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Horizontal louver blinds with aluminum slats.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of horizontal louver blind.

B. Product Test Reports: For each type of horizontal louver blind, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hunter Douglas Contract.
2. Levolor Contract; a Newell Rubbermaid company.
3. Springs Window Fashions.

B. Basis of Design: Refer to Architect’s Master Schedule.

C. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
   1. Width: 1 inch.
   2. Thickness: Not less than 0.008 inch.
   3. Spacing: Manufacturer's standard.
   4. Finish: Reflective finish on outside-facing surface of slat to enhance reflection of solar energy.
   5. Features:
      a. Lift-Cord Rout Holes: Minimum size required for lift cord and located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.

D. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.
   1. Capacity: One blind per headrail unless otherwise indicated.
   2. Ends: Manufacturer's standard.
   3. Manual Lift Mechanism:
      a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range.
      b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.
   4. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
      a. Tilt: Full.
      b. Operator: Clear-plastic wand.
      c. Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over rotation of gear.
      d. Length of Tilt Control: Length required to make operation convenient from floor level.
   5. Manual Lift-Operator and Tilt-Operator Lengths: Manufacturer's standard.
   6. Manual Lift-Operator and Tilt-Operator Locations: Right side and left side of headrail, respectively unless otherwise indicated.
   7. Integrated Headrail/Valance: Curved face.

E. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
   1. Type: Manufacturer's standard.

F. Lift Cords: Manufacturer's standard braided cord.

G. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
   1. Type: Braided cord.

H. Valance: Two slats.

I. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
   1. Type: Wall.
   2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.

J. Cord Holder: Manufacturer standard.

K. Colors, Textures, Patterns, and Gloss:
   1. Slats: As selected by Architect from manufacturer's full range.
   2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

2.3 HORIZONTAL LOUVER BLIND FABRICATION

A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
   1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.

C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
   1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

F. Color-Coated Finish:
1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
2. Install mounting and intermediate brackets to prevent deflection of headrails.
3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer and that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

END OF SECTION 12 21 13

SECTION 12 24 13 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Manually operated roller shades with single rollers.
   2. Motor-operated roller shades with single rollers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
   1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.

C. Samples for Verification: For each type of roller shade.
   1. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.

D. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material, signed by product manufacturer.

C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.9 WARRANTY

A. Manufacturer's Warranties: Provide the following limited warranties:
1. Hardware and Shade Fabric: 25 years from date of substantial Completion.
2. Motors and Controls: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CACO, Inc.
2. Draper Inc.
3. Hunter Douglas Contract.
4. Levolor Contract.

B. Basis-of-Design Product: Refer to Master Schedule

C. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
1. Bead Chains: Manufacturer's standard.
a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Clip, jamb mount
2. Chain-Retainer Type: [Clip, jamb mount] [Chain tensioner, jamb mounted] [Chain tensioner, sill mounted] <Insert description>Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
a. Provide for shadebands that weigh more than or for shades as recommended by manufacturer, whichever criteria are more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
1. Roller Drive-End Location: Right side of inside face of shade.
2. Direction of Shadeband Roll: Regular, from back of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

E. Shadebands:
1. Shadeband Material: Refer to Master Schedule
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
a. Type: Enclosed in sealed pocket of shadeband material.

F. Installation Accessories:
1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 4 inches.
b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
2. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
a. Closure-Panel Width: 2 inches.

3. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
4. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
5. Installation Accessories Color and Finish: As selected from manufacturer's full range.
6. Bead Chain Hold Down: Spring-Loaded Tensioner complying with ANSI/WCMA A100.1-2022 safety standard.

2.3 MOTOR-OPERATED, SINGLE-ROLLER SHADES

A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.
a. Electrical Characteristics: 120 VAC, single phase, 60 hz.
b. Instantly reversable, lifetime lubricated, and equipped with internal thermal overlaod protector, electric brake, and pre-set accessible limit switches.
c. Tubular motor shall be concealed inside each shade roller tube.
3. Group Control: ISO relay – UL lited component.
a. Provide one ISO relay per motor to allow for 110-120V group switching via toggle switch. Allow for 12 motors on one switch.
4. Crank-Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.
5. Operating Features:
a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
b. Override switch.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers that are operated by one roller drive-end assembly.

E. Shadebands:
1. Shadeband Material: As indicated on Architect’s Master Schedule.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

F. Installation Accessories:
1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
a. 4 inches.
b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
2. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
a. Closure-Panel Width: 2 inches.
3. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
4. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
5. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.4 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Basis of Design: Refer to Master Schedule

2.5 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 12 24 13

SECTION 12 36 23.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes plastic-laminate countertops.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show locations and sizes of cutouts and holes for plumbing fixtures[and other items installed in plastic-laminate countertops.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidityat occupancy levels during the remainder of the construction period.

C. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
   1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Abet Laminati, Inc.
      b. Formica Corporation.
      c. Lamin-Art, Inc.
      d. Panolam Industries International, Inc.
      e. Wilsonart International; Div. of Premark International, Inc.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As indicated by manufacturer's designations.
   2. Match Architect's sample.
   3. As selected by Architect from manufacturer's full range in the following categories:
      a. Solid colors, matte finish.
      b. Wood grains, gloss finish.
      c. Patterns, gloss finish.
   4. Grain Direction: Parallel to cabinet fronts.

D. Core Material:
   1. Countertops in non-wet areas: Medium-density fiberboard, MDF, MR10 – ANSI A208.2, Grade 130
   2. Countertops in semi-wet areas (restroom and breakrooms with sinks): Medium-density fiberboard, MR30 – ANSI A208.2, Grade 155
   3. Countertops in wet areas (laboratories, locker rooms, laundry area and cafeteria): Medium-density fiberboard, MR50 - ANSI A208.2, Grade 150

E. Core Thickness:
   1. Build up countertop thickness to as indicated on drawings.

F. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.

2.3 ACCESSORIES

A. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

2.4 MISCELLANEOUS MATERIALS

A. Adhesive for Bonding Plastic Laminate: Contact cement.
   1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

B. VOC Limits for Installation Adhesives and Sealants: Use products that comply with the limits for VOC content as indicated in Section 01 81 13.02 “Sustainable Design Requirements”

2.5 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:
   1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
   1. Seal edges of openings in countertops with a coat of varnish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
   1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
   1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
   1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   2. Secure backsplashes to walls with adhesive.
   3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 12 36 62 – SOLID SURFACING MATERIAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes solid surfacing for the following:
   1. Lavatory tops
   2. Counter tops

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show thickness, finish, layout, and anchorage details. Indicate attachment methods, seams, joint treatments, and supports.
   1. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in countertops for architectural woodwork
   2. Show seam locations.
   3. Full-size details, edge details, attachments, etc
   4. Locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections

C. Samples for Verification: For the following:
   1. Solid surfacing materials, 6 inches square.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: Submit manufacturer's recommended cleaning and maintenance procedures.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating engineered stone surfacing material with minimum 5 years experience.

B. Fire-Test-Response Characteristics: Provide surfacing material with the following surface-burning characteristics (if required by code) as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. Class I per ASTM E-84 including:
      a. Flame Spread: 25 or less.

1.6 PROJECT CONDITIONS

A. Field Measurements: Where surfacing is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 WARRANTY

A. Manufacturer's 10 year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

PART 2 - PRODUCTS

2.1 QUARTZ SURFACING

A. Acceptable Manufacturer:
   1. Corian Quartz Surfaces by DuPont.

B. Basis of Design: Refer to Master Schedule.

2.2 MATERIALS

A. Quartz Surfacing Material: Nonporous, sound, hard, durable, heat resistant engineered stone meeting the following criteria:
   1. Stain Resistance (ASTM D 2299, NEMA LD3): No effect.
   2. Izod Impact Strength (ASTM D 256): Average 0.361 ft.lbs/inch of notch.
   3. Impact Strength (2 lb. Ball from 8'-0"): Passed.
   4. Liquid Absorption (ASTM C 97): 0.022 percent.
   5. Surface Burning Characteristics (ASTM E 84):
      a. Flame Spread: 10.
   6. Thermal Shock (ASTM C 484): Passed 5 cycles.
   7. Thickness: As scheduled.
   8. Appearance, Color, and Sheen: Refer to Master Schedule.

2.3 MISCELLANEOUS MATERIALS

A. Adhesives and Cements: Non-staining, type as recommended by engineered stone manufacturer.
   1. Waterproof, permanent material which will not induce mildew and fungus growth.

B. Joint Sealants: Two part color matched polyester knife grade adhesive.

C. Special Features: Provide edge treatments as detailed in Drawings.

2.4 FABRICATION

A. Assemble work at shop and deliver to job ready for installation. Manufacture in largest practical lengths with seams in least conspicuous locations.

B. Fabricate work square and to required lines.

C. Recess and conceal fasteners, connections, and reinforcing.

D. Design construction and installation details to allow for expansion and contraction of materials. Properly frame material with tight, hairline joints held rigidly in place.

E. Comply with adhesive manufacturer's recommendations for adhesive shelf life, pot life, working life, mixing, spreading, assembly time, time under pressure and ambient temperatures.

F. Fabricate countertops with backsplash and side splashes to profiles indicated or detailed.

G. Fabricate items to profiles shown with connections and supports as detailed or as required for proper installation per manufacturer's recommendations.

H. Provide cut-outs for plumbing fixtures and trim, washroom accessories, appliances, and related items. Confirm layout with manufacturer's cut-outs templates before beginning work. Round corners of cut-outs and sand edges smooth.

I. Do not exceed manufacturer's recommended unsupported overhang distances.

J. Finish exposed surfaces smooth and polish to a sheen indicated.

K. Radius corners and edges.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's printed instructions and approved shop drawings. Provide templates and rough-in measurements.

B. Install surfacing true in line and plane, level, rigid and solidly adhered to substrate.

C. Pre-fit items: Adjust supports to make fit. Align joints over support framing.
   1. Provide intermediate supports to that material will not span more than 3 feet in any direction.
   2. Cantilevers shall not exceed 12 inches without supplementary support.

D. Apply dabs of mastic on supports; place items on supports and attach.

E. Install with minimum number of joints practical, using full-length pieces from maximum lengths available. Cope at returns and square at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Radius cutouts with minimum 3/8 inch corner radius.

F. Install splashes using adhesive. Apply adhesive to back surface only. Place thin bead of seam adhesive along edge where splashes seat.

3.2 TOLERANCES

A. Variation in Component Size: Plus or minus 1/8 inch over 10’-0” length.

B. Location of Openings: Plus or minus 1/8 inch from indicated location.

C. Install countertops level to within 1/8 inch in 10 feet.

D. Allow minimum 1/16 inch clearance between edges of countertops and adjacent walls.

E. Maximum Offset From True Position: 1/8 inch.

3.3 CLEANING

A. Clean and polish fabrications in accordance with manufacturer's instructions.

END OF SECTION

SECTION 14 24 00 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes hydraulic passenger elevators.

1.3 DEFINITIONS

A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems.

B. Shop Drawings:
   1. Include plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment.
   2. Include large-scale layout of car-control station.
   3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

C. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch-square Samples of sheet materials; and 4-inch lengths of running trim members.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard one-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.9 COORDINATION

A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Furnish well casing and coordinate delivery with related excavation work.

C. Coordinate locations and dimensions of other work relating to hydraulic elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
   2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Otis.
   2. Schindler Elevator Corp.
   3. TKE.

B. Basis of Design: TKE; endura A.

C. Source Limitations: Obtain elevators from single manufacturer.
   1. Major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with Section 407 in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

2.3 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturers' standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description:
   1. Type: Twinpost, holeless, two-stage.
   2. Rated Load: 2100 lb.
   3. Rated Speed: 110 fpm.
   4. Door Type: Single speed, side-opening.
   5. Controller: Non-proprietary.
   6. Auxiliary Operations:
      a. Battery-powered lowering.

b. Fire service provisions.
c. Automatic fan/light shutdown.
d. Two-speed fan.

7. Car Enclosures:
   a. Inside Width: 68 inches from side wall to side wall.
   b. Inside Depth: 51 inches from back wall to front wall (return panels).
   c. Inside Height: 88 inches to underside of ceiling.
   d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish with integral car door frames.
   e. Car Fixtures: Satin stainless steel, No. 4 finish .
   f. Side and Rear Wall Panels: Plastic laminate .
   g. Reveals: Powder-coated steel.
   h. Door Faces (Interior): Satin stainless steel, No. 4 finish.
   i. Door Sills: Aluminum.
   j. Ceiling: Powder-coated, luminous ceiling.
   k. Handrails: 1-1/2 inches round satin stainless steel, No. 4 finish, at rear and side walls.
   l. Floor prepared to receive resilient flooring (specified in Section 09 65 19 "Resilient Tile Flooring").
8. Hoistway Entrances:
   a. Width: 88 inches.
   b. Height: 155 inches.
9. Hall Fixtures : Satin stainless steel, No. 4 finish .
10. Additional Requirements:
    a. Hoistway access at top and bottom landings.
    b. Emergency ADA phone.

2.4 SYSTEMS AND COMPONENTS

A. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.
   1. Pump shall be submersible type with submersible squirrel-cage induction motor, and shall be suspended inside oil tank from vibration isolation mounts.
   2. Motor shall have solid-state starting.
   3. Motor shall have variable-voltage, variable-frequency control.

B. Hydraulic Silencers: System shall have hydraulic silencer containing pulsation-absorbing material in blowout-proof housing at pump unit.

C. Piping: Size, type, and weight of piping as recommended by elevator manufacturer, with flexible connectors to minimize sound and vibration transmissions from power unit.

D. Hydraulic Fluid: Elevator manufacturer's standard fire-resistant fluid with additives as needed to prevent oxidation of fluid, corrosion of cylinder and other components, and other adverse effects.

E. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.

F. Corrosion-Protective Filler: A nontoxic, petroleum-based gel formulated for filling the space between hydraulic cylinder and protective casing. Filler shall be electrically nonconductive, displace or absorb water, and gel or solidify at temperatures below 60 deg F.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Hydro Safe Oil Division, Inc.; No-Ox-Id Liquid Elevator Casing Filler E-800.

G. Car Frame and Platform: Welded or bolted steel units.

H. Guides: Roller guides; polymer-coated, nonlubricated sliding guides; or sliding guides with guide-rail lubricators. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

A. General: Provide manufacturer's standard microprocessor operation system as required to provide type of operation indicated.

B. Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated:

1. Single-Car Battery-Powered Lowering: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it is lowered to a preselected floor, opens its doors, and shuts down. If car is below the preselected floor, it is lowered to the next lower floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.

C. Security Features: Provide the following security features, where indicated. Security features shall not affect emergency firefighters' service.
1. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at car-control stations and hall push-button stations.

2.6 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

A. General: Provide steel-framed car enclosures with nonremovable wall panels, with removable car roof, access doors, power door operators, and ventilation.
1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.

2.8 HOISTWAY ENTRANCES

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.
1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.

2.9 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with long-life lamps and acrylic or other permanent, non-yellowing translucent plastic diffusers or LEDs.

B. Car-Control Stations: Provide manufacturer's standard car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.
1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.

C. Swing-Return Car-Control Stations: Provide car-control stations mounted on rear of hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.
1. Mark buttons and switches for function. Use both tactile symbols and Braille.

D. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

F. Hall Push-Button Stations: Provide one hall push-button station at each landing.
1. Provide manufacturer's standard wall-mounted units.
2. Equip units with buttons for calling elevator and for indicating applicable direction of travel.

G. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:
1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.

H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
1. At manufacturer's option, audible signals may be placed on cars.

2.10 FINISH MATERIALS

A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

C. Stainless-Steel Bars: ASTM A 276, Type 304.

D. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

E. Aluminum Extrusions: ASTM B 221, Alloy 6063.

F. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Excavation for Cylinder: Drill well hole in elevator pit to accommodate installation of cylinder.

B. Provide waterproof well casing as necessary to retain well-hole walls.

C. Install cylinder in protective casing within well hole. Before installing protective casing, remove water and debris from well hole[and provide permanent waterproof seal at bottom of well casing].
1. Fill void space between protective casing and cylinder with corrosion-protective filler.
2. Align cylinders and fill space around protective casing with fine sand.

D. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor. Seal between well casing and pit floor with 4 inches of nonshrink, nonmetallic grout.

E. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.

F. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS workmanship and welding operator qualification standards.

G. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

H. Install piping above the floor, where possible. Install underground piping in casing.

I. Lubricate operating parts of systems as recommended by manufacturers.

J. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

K. Leveling Tolerance: 1/4 inch, up or down, regardless of load and travel direction.

L. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

M. Locate hall signal equipment for elevators as follows, unless otherwise indicated:
1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
2. Place hall lanterns either above or beside each hoistway entrance.
3. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

A. Temporary Use: Limit temporary use for construction purposes to one elevator. Comply with the following requirements for each elevator used for construction purposes:
1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate[, adjust, and maintain] elevator(s).

B. Check operation of each elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
1. Perform maintenance during normal working hours.
2. Perform emergency callback service during normal working hours with response time of two hours or less.
3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

END OF SECTION

SECTION 14 27 00 - ELEVATOR RENOVATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Updating elevator controls, equipment, cab enclosures, and signals.

1.2 SUBMITTALS

A. Product Data for each principal component or product of each elevator. Indicate capacities, sizes, performance and operating characteristics, features of control system, finishes, and similar information. Indicate any variations from specified requirements.

B. Shop Drawings including dimensioned drawings showing plans, elevations, sections and large-scale details indicating service at each landing, coordination with building structure and relationships with other construction, and details of car enclosures and hoistway entrances. Include elevatoring diagrams to indicate elevator service to each level and include excavation requirements for jack.

C. Wiring diagram detailing wiring for power, signal and control systems differentiating clearly between manufacturer-installed wiring and field-installed wiring. Indicate maximum and average power demands.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: In addition to local governing regulations, comply with applicable provisions in ASME A17.1, "Safety Code for Elevators and Escalators."

B. Accessibility Requirements:
1. In addition to local governing regulations, comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)," or local or state codes, whichever is more stringent, for installing work for accessibility to the handicapped.
2. Texas Accessibility Standards.

1.4 WARRANTY

A. Special Project Warranty: Provide special project warranty, signed by Sub-contractor, Installer, and Manufacturer, agreeing to replace, repair, or restore defective materials and workmanship of elevator work during warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.
1. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected, and unsatisfactory conditions.
2. Warranty period is 24 months starting on date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONTROLLER

A. Elevator Controller: The Elevator control system shall be TAC 32 Digital Controller by ThyssenKrupp Elevator or equal. Provide above manufacturer's standard microprocessor operation system for each elevator as required to provide type of operation system indicated. The elevator controller shall use a microprocessor based logic system and shall be ASME A17.1 compliant including all applicable elevator and electrical safety codes to include the following:
1. Provide "Duplex Selective Collective Automatic Operation" as defined in ASME A17.1, Safety Code for Elevators and Escalators.
2. Programmable Logic
3. All available programming options or parameters shall be field programmable, without need for any external device or knowledge of any programming languages. Programmable options and

parameters shall be stored in nonvolatile memory. At a minimum, there shall be a 32-character alphanumeric display used for programming and diagnostics.

2.2 SIGNAL EQUIPMENT

A. General: Provide signal equipment for each elevator to comply with requirements indicated below.

B. Except for buttons and illuminated signal elements, fabricate signal equipment with exposed surfaces of stainless steel with manufacturer's standard directional polish or satin finish.

C. Car Control Stations: Provide new car control stations in each car with flush-mounted metal faceplates containing call button for each landing served and other buttons, switches, and controls required for specified car operation and control. Mount as shown or scheduled at height complying with accessibility requirements (refer to Quality Assurance Article above). If not otherwise indicated, mount in return panel adjacent to car door. Provide operating device symbols as required by Code. Mark other buttons and switches with manufacturer's standard identification for required use or function.

D. Car Position Indicator: Provide either illuminated-signal type or digital-display type, located near top of each car or in car control station. Include direction-of-next-travel signal if not provided in car control station.
1. In addition to visual indicator, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.

E. Hall Push-Button Station:
1. Provide 1-button station where only one direction of travel is available and indicate which direction that is.
2. Provide hall push-button station at each landing for each elevator.

F. Hall Lanterns: Provide units with illuminated "up" and "down" signal arrows, but provide single arrow where only one direction is possible. Provide units projecting from faceplate for ease of angular viewing, except provide flush units where a location in hoistway entrance frame is indicated. Match materials, finishes, and mounting method of hall push-button stations.
1. At manufacturer's option, hall lantern signals may be placed either above or beside each hoistway entrance or in both jambs of entrance frame for each elevator. Mount at minimum of 6'- 0" above finished floor.
2. In conjunction with each hall lantern device, provide an audible signal to indicate that a car is arriving in response to a hall call and to indicate direction of car travel. Signal shall sound once for up direction of travel and twice for down direction.

G. Telephone: Provide hands-free telephone equipment in each cab, and wire back to elevator equipment room, contained in flush-mounted cabinet and complete with identification and instructions for use. Provide accessible pull on cabinet door. Provide a fireman's telephone cabinet or fireman's telephone jack in main elevator lobby.

H. Alarm System: Provide emergency alarm bell properly located within building and audible outside hoistways, equipped to sound automatically in response to emergency stops and in response to "Alarm" button on each car control station.

2.3 PERSONAL PROTECTIVE DEVICES

A. Door Edge Protective Device: Provide retractable edge shoe on leading edges of elevator entrance doors that causes doors to stop and reopen upon contacting an obstruction in entrance.

B. Photo-Eye Detection Device: Provide electronic photo-eye device with timed cutout, projecting dual light beams across car entrance at 5 inch and 29 inch heights, that when interrupted will cause closing doors to stop and reopen. Provide keyed switch in car operating panel or toggle switch in service cabinet for disconnecting photo-eye protective device.

2.4 HOISTWAY EQUIPMENT

A. Guide Rails: Retain / extend main rails in place.
1. Clean rails and brackets. Remove rust.
2. Check all rail and bracket fastenings and tighten.
3. Realign rails as required to provide smooth car ride.
4. Provide supplemental rail brackets and/or backing as required by Code or to enhance car ride quality.

B. Buffers, Car: Retain existing.
   1. Drain, flush, refill, and test.
   2. Rebuild as required and paint.
   3. Retrofit switch to limit elevator speed if buffer is compressed.
   4. Retrofit buffer access ladder and platform.

C. Sheaves: Retain existing.
   1. Regroove or replace if required.
   2. Check all fastenings and tighten.
   3. Replace worn bearings.

D. Counterweight: Retain existing. Replace worn rollers.

E. Counterweight Guard: Metal guard in pit. Where counterweight is provided between adjacent elevators, provide runway guard next to the adjacent elevator.

F. Governor and Encoder Pit-tensioning Sheaves: New.

G. New governor rope with proper tensioning.

H. For extend elevator shaft. Replace if conditional wear requires replacement. Warranty for 5 years. No proration’s allowed.

I. Terminal Stopping: Provide normal and final devices. Provide emergency terminal speed limiting devices.

J. Electrical Wiring and Wiring Connections:
   1. Conductors and Connections: Copper throughout with individual wires coded and connections on identified studs or terminal blocks. Use no splices or similar connections in wiring except at terminal blocks, control compartments, or junction boxes. Provide 10% spare conductors throughout. Run spare wires from car connection points to individual elevator controllers in the machine room. Provide four pair of spare shielded communication wires in addition to those required to connect specified items. Tag spares in machine room.
   2. Conduit: Painted or galvanized steel conduit, EMT, or duct. Conduit size, 1/2". Flexible heavy-duty service cord may be used between fixed car wiring and car door switches for door protective devices.
   3. Traveling Cables: Flame and moisture-resistant outer cover. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway.
      a. Provide five (5) pair of shielded wires and two (2) RG-6/U type coaxial cables for card reader. Provide two (2) pair 14 gauge wire for CCTV power.
   4. Auxiliary Wiring: Connect fire alarm initiating devices, emergency two-way communication system, firefighters" phone jack, paging speaker, card reader, intercom, and announcement speaker in each car controller in machine room. If required

K. Entrance Equipment: Retain existing. Refurbish/replace and adjust assemblies to ensure smooth and quiet mechanical open and close of doors.
   1. Door Hangers and Rollers: Replace as required.
   2. Door Track: Refurbish and/or replace as required.
   3. Door Interlocks: New.
   4. Door Closers: New.

L. Hoistway Door Unlocking Device: Provide unlocking device with escutcheon in door panel at all floors, with finish to match adjacent surface.

M. Hoistway Access Switches: Mount in wall at top and bottom floors. Provide switch with faceplate.

N. Entrance Equipment: Retain existing.

2.5 HOISTWAY ENTRANCES

A. Frames: Retain existing.

B. Door Panels: Retain existing.

C. Sight Guards: Retain existing. Replace damaged sight guards.

D. Sills: Retain existing. Clean and polish. Check and tighten all fastenings.

E. Fascia, Toe Guards, and Hanger Covers: Retain existing. Provide as required where damaged or missing. Check and tighten all fastenings.

F. Struts and Headers: Retain existing. Check and tighten all fastenings.

2.6 CAR EQUIPMENT

A. Frame: Retain Existing. Check and tighten all fastenings.

B. Platform: Retain existing. Reinforce if required. Check and tighten all fastenings.

C. Toe Guard: Provide new extended toe guard to meet Code. Minimum 14 gauge steel, reinforced and braced to car platform front with black enamel.

D. Guide Shoes: Retain existing. Check and tighten all fastenings. Replace worn rollers or inserts.

E. Sills: Retain existing. Clean and polish. Check and tighten all fastenings.

F. Doors: Retain existing. Retrofit dual gibs, one at trailing edge and one at leading edge of each panel.

G. Door Operator: Provide new high performance, closed loop door operator TKE HD-LM or equal with closing speed of at least 2.5 f/s.

H. Door Hangers: Replace with new.

I. Door Track: Replace with new.

J. Door Header: Retain existing. Check and tighten all fastenings.

K. Door Electrical Contact: New.

L. Door Clutch: New.

M. Restricted Opening Device: Restrict opening of car door(s) outside unlocking zone.

N. Door Control Device: Retain Existing

2.7 CAR ENCLOSURE

A. Plastic-Laminate Panels: Plastic laminate on 3/4-inch fire-rated core.

B. Stainless Panels: Satin stainless steel, No. 4 finish on 1-inch fire-rated core.

C. Handrail Backer: Satin stainless steel, No. 4 finish on 1-inch fire-rated core.

D. Base: Satin stainless steel, No. 4 finish on 1-inch fire-rated core.

E. Frieze: Satin stainless steel, No. 4 finish on 1-inch fire-rated core.

F. Reveals: Recessed, No. 4 bronze finish.

G. Suspended Ceiling: Standard six panel ceiling, plastic laminate on 3/4-inch fire-rated core with 1/4-inch routed reveals painted, colors as selected by Architect.

H. Light Cove: 3700K high-output LED perimeter lighting fixtures.

I. Handrails: 1 1/2-inch diameter No. 4 stainless-steel finish with 1-inch diameter brackets, at sides and rear of car.

J. Front Cladding: 20 gage satin stainless steel, No. 4 finish with fire-rated blocking.

K. Interior Blocking: 3/16 inch fire rated blocking, painted black.

L. Flooring: As scheduled in Interior Finish Legend on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions.

3.2 PROTECTION

A. Temporary Use: Do not use elevators for construction purposes unless cars are provided with temporary enclosures, either within finished cars or in place of finished cars, to protect finishes from damage.

1. Provide protective coverings, barriers, devices, signs, and other procedures to protect elevators. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

END OF SECTION

SECTION 14 42 00 - WHEELCHAIR LIFTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Vertical platform lifts.

1.3 DEFINITIONS

A. Definitions in ASME A18.1 apply to Work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components, and finishes for lifts.
   2. Include rated capacities, operating characteristics, electrical characteristics, safety features, controls, finishes, and accessories.

B. Shop Drawings: For each lift.
   1. Include plans, elevations, sections, details, attachments to other work, and required clearances.
   2. Indicate dimensions, weights, loads, and points of load to building structure.
   3. Include details of equipment assemblies, method of field assembly, components, and location and size of each field connection.
   4. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For surfaces and components with factory-applied color finishes.
   1. Include Samples of integrally colored materials and accessories involving color selection.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer Installer.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lift to include in operation and maintenance manuals.
   1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
      a. Parts list with sources indicated.
      b. Recommended parts inventory list.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted use of lifts.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
   1. Maintenance Proximity: Not more than [two] <Insert number> hours' normal travel time from Installer's place of business to Project site.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of lifts that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

B. Regulatory Requirements: Comply with ASME A18.1, "Safety Standard for Platform Lifts and Stairway Chairlifts."

2.2 VERTICAL PLATFORM LIFT

A. Vertical Platform Lift, General: Preengineered lift system.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Garaventa Accessibility.
      b. Inclinator Company of America.
      c. ThyssenKrupp Access.
   2. Basis of Design: Garaventa; Genesis Opal.

B. Number of Stops: Two.

C. Platform Size: 49 by 51 inches.

D. Door Operation and Clear Opening Width: Low-energy, power-operated doors that remain open for 20 seconds minimum; end door with minimum 32-inch side door with minimum 42-inch clear opening width.

E. Rated Speed: 3 meters (10-feet) per minute

F. Rated Load: 750 lbs.

G. Power Supply: 120 VAC, single phase.

H. Emergency Operation: Provide manual operation to raise or lower unit in case of malfunction or power loss.

I. Attendant Operation: Provide attendant call device at each landing.

J. Self-Supporting Unit: Support vertical loads of unit only at base, with lateral support only at landing levels.

K. Platform Low-Profile Carriage: Fabricate platform floor assembly to a total thickness not exceeding 1-1/2 inches.

L. Platform Enclosure and Door: Extruded-aluminum frame with flush galvanized-steel aluminum-sheet panels.

M. Platform Top: Provide a non-load-bearing top, matching construction of enclosure walls. Permanently mark top to indicate that it cannot sustain a load.

N. Ramp: Fixed ramp matching platform to provide transition from floor to lift platform at bottom landing.
   1. Ramp Size: End ramps a minimum of 32 inches wide; length as required for slope.
   2. Ramp Slope: Maximum 1:12.
   3. Ramp Finish: Finish ramps to match lift platform.

O. Accessories: Provide units with the following accessories:
   1. Fold-down seat with seatbelt.

2.3 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500/A 500M.

C. Steel Pipe: ASTM A 53/A 53M; standard weight (Schedule 40) unless otherwise indicated or required by loads.

D. Steel Sheet: ASTM A 1008/A 1008M, cold-rolled commercial steel (CS) or ASTM A 1011/A 1011M hot-rolled, commercial steel (CS); as required for each use.

E. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 zinc coating,

F. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; manufacturer's standard strengths and thicknesses for type of use.
1. Extruded Aluminum: ASTM B 221.
2. Aluminum Sheet and Plate: ASTM B 209.

G. Expansion Anchors: Anchor-bolt-and-sleeve assembly of material indicated below with capability to sustain a load equal to 10 times the load imposed as determined by testing according to ASTM E 488 conducted by a qualified independent testing agency.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Group 1, Alloy 304 or Alloy 316, stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

2.4 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 FINISHES

A. Factory Finish:
1. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
2. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance of the Work.

B. Minimum Headroom Clearance: Verify that installed lift will have a minimum headroom of 80 inches above any point on platform floor at any point of travel.

C. Minimum Headroom Clearance: Verify that installed lift will have a minimum headroom of 79 inches at any point during travel.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with ASME A18.1 and manufacturer's written instructions for installation of lifts unless otherwise indicated.

B. Wiring Method: Conceal conductors and cables within housings of units or building construction. Do not install conduit exposed to view in finished spaces. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

C. Coordinate runway doors with platform travel and positioning, for accurate alignment and minimum clearance between platforms, runway doors, sills, and door frames.

D. Position sills accurately and fill space under sills solidly with nonshrink, nonmetallic grout.

E. Coordinate platform doors with platform travel and positioning.

F. Adjust stops for accurate stopping and leveling at each landing, within required tolerances.
1. Leveling Tolerance: 1/4 inch up or down, regardless of load and direction of travel.

G. Lubricate operating parts of lift, including drive mechanism, guide rails, hinges, safety devices, and hardware.

H. Test safety devices and verify smoothness of required protective enclosures and other surfaces.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of lift installation and before permitting use of lifts, perform acceptance tests as required and recommended by ASME A18.1 and authorities having jurisdiction.

B. Operating Test: In addition to acceptance testing, load lifts to rated capacity and operate continuously for 30 minutes between lowest and highest landings served. Readjust stops, signal equipment, and other devices for accurate stopping and operation of system.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on lifts.

3.4 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of lift Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper lift operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lifts. Include a review of emergency systems and emergency procedures to be followed at time of operational failure and other building emergencies.

B. Check operation of lifts with Owner's personnel present and before date of Substantial Completion. Determine that operating systems and devices are functioning properly.

C. Check operation of lifts with Owner's personnel present not more than one month before end of warranty period. Determine that operating systems and devices are functioning properly.

END OF SECTION 14 42 00

SECTION 21 01 00 - FIRE PROTECTION GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 APPLICABILITY

A This section applies to and forms a part of each of the sections of Division 22. This section, and each of the sections to which it applies, is subject to the requirements of the Instructions to Bidders, General Conditions, and Special Conditions of these complete specifications.

B The work covered by this Division of the Specifications consists of furnishing all labor, supervision, equipment, materials, all incidentals, related items, and appurtenances, and performing all operations necessary to complete the installation of work in strict accordance with these specifications and drawings.

C All work shall be finished, tested and ready for operation.

1.2 DEFINITIONS

A Words "Material" or "Furnish" where written in Division 21 specifications and drawings shall mean any and all apparatus, equipment, devices, fixtures, components, products, assemblies, items, parts, things, and any other pieces specified or shown or required.

B Words "Labor" or "Install" where written in Division 21 specifications and drawings shall mean any and all physical effort, manpower, time, expertise, tools, equipment and services to carefully assemble, install and affix all material in a proper, complete and acceptable manner.

C Word "Provide" where written in Division 21 specifications and drawings shall mean "Mechanical Contractor shall furnish all labor and material and completely and properly install such material and leave same in acceptable condition and intended acceptable working order".

1.3 DISCREPANCIES OR OMISSIONS FROM DRAWINGS OR DOCUMENTS

A Notify the Engineer of any discrepancies in, or omissions from the drawings or documents. Neither the Owner nor the Architect will be responsible for any oral instructions or modifications of the specifications or drawings. Written interpretations will be made only by Addenda.

B If discrepancies are not reported, the contractor shall bid the greater quantity or better quality (highest dollar value), and appropriate adjustment will be made after contract award.

C Discrepancies discovered during construction shall immediately be called to the attention of the Architect/Engineer for clarification.

D All minor items necessary for the completion and successful operation of the system, whether or not herein definitely specified or indicated on the drawings, shall be furnished and installed.

E Omission of/or express reference to any material necessary for/or reasonably incidental to complete installation shall not release Contractor from providing such material. Where material is shown on drawings but is not specified or is specified but not shown, such material shall be considered both shown and specified.

F Any work not clear to Contractor shall be referred to Engineer for clarification before bid is submitted. If no question is raised prior to opening of bid, Contractor shall be required to provide work in question as directed by Engineer, whose decision is final, without additional charges.

G By virtue of submitting a bid, Contractor agrees that they are skilled and experienced in use of and in interpretation of drawings and specifications. Contractor further agrees that they have carefully reviewed all drawings, all specifications, and all addenda, which constitute bid documents for this contract, and finds them free of ambiguities and good and sufficient for bidding and construction purposes.

1.4 DRAWINGS

A All piping shall be routed so as not to obstruct access to other equipment (i.e. VAV box controls, electrical devices, fire alarm devices, etc.). It shall be this contractor’s responsibility to coordinate with other trades for accessibility.

B Any work or system on the roof not explicitly indicated on the roof plan shall be approved by the engineer prior to installing.

C In general, the fire protection drawings are drawn to scale as noted. Obtain dimensions and locations of partitions, walls, etc., from the Architectural drawings wherever possible and do not scale the drawings. Consult the Architectural drawings for details of construction, location of suspended ceilings, ceiling heights, and other pertinent information. Architect's drawings shall not take precedence over field measurements.

D All drawings and specifications shall be considered in bidding. The drawings and specifications are complimentary, and what is called for in either of these shall be as binding as though called for by both. Should any conflict arise between drawings and specifications, such conflict shall be brought to the attention of the Architect.

1.5 EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

A When any Contractor submits approval of materials and/or equipment of different physical size, weight, capacity, electrical characteristics, function, color, access, it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc.

B In all cases where substitutions or deviations affect other trades, the contractor requesting or submitting such substitutions shall advise all such contractors of the change and shall compensate them for all necessary changes in their work. In the event that a substitution or deviation is approved, it is the submitting contractor's responsibility to coordinate any changes with the effected contractors. Any drawings, specifications, diagram, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense.

1.6 PRIOR APPROVAL REQUEST

A Requests for substitution of materials and/or equipment other than those named in the specifications may be made to the Architect/Engineer. The request shall include complete information, test, etc. relating to quality, performance, and suitability. All requests shall be in the Architects/Engineers office not later than ten (10) days prior to the Bidding date. All approved requests shall be included in the project addenda.

1.7 INSTRUCTION OF OWNER’S EMPLOYEES

A Furnish, without additional expense to the Owner, the services of competent instructors, who will give full instructions in the care, adjustment, and operation of all parts of the mechanical equipment to the Owner's employees who are to have charge of the equipment.

B An operating and maintenance manual shall be made available to the Owner's operating personnel during the instruction and left with the Owner upon completion of the instruction.

C Instruction of Owner's Employees" form at end of this section shall be filled out and signed by Contractor and Owner's Representative and three (3) signed copies of form sent to Engineer.

1.8 INSTALLATION OF EQUIPMENT

A All appliances and equipment shall be installed and connected in accordance with manufacturer's instructions and recommendations unless such instructions are in conflict with these specifications. Auxiliary piping, valves, electrical connections, etc., recommended by the manufacturer or required for proper operation shall be furnished and installed complete.

B All equipment shall be installed in such a manner and location as to facilitate accessibility for maintenance and/or replacement.

1.9 RECORD DRAWING

A The contractor shall maintain one set of drawings at the job site used as a master copy. Each change order or other revision, deletion, or addition shall be clearly marked and noted by colored pencil. This copy of plans shall be furnished to the Architect upon completion of the project.

B The contractor shall note on the record drawings the elevations and/or inverts of all mechanical services (i.e., sewer, water, etc.) where they exit the building foundation. The contractor shall also record dimensions from the building to points on all mechanical equipment installed (ie., fuel tanks, oil piping, etc.).

C A complete set of these drawings shall be scanned at a resolution of 600dpi in color and saved in an Adobe PDF portfolio format with index to each sheet by name and burned to a non-volatile media. The electronic copy of the as-built drawings shall be transmitted to the Architect. After review and approval by the Architect, the as-built drawings will be turned over to the Owner.

1.10 COOPERATION WITH OTHER TRADES

A Cooperate with other trades so as to avoid interferences. Where required to avoid interferences with other work or to increase the headroom, the Contractor shall off-set the piping and/or re-route the duct work where directed by the Engineer. Carefully check all construction details to assure the proper installation of all work under this specification. Schedule the work such that it will keep pace with the work of other crafts and cause no delay.

B The Contractor shall furnish to other trades, as required, all necessary electrical characteristics, templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.11 EQUIPMENT SUPPORT

A Each piece of equipment, apparatus, piping, or conduit suspended from the ceiling or mounted above the floor level shall be provided with suitable structural support, pipe stand, platform or carrier in accordance with the best recognized practice. Such supporting or mounting means shall be provided by the Contractor for all equipment and piping. Exercise extreme care that structural members of building are not overloaded by such equipment. Provide any required additional bracing, cross members, angles, support, etc.

1.12 PIPE MOUNTING HEIGHTS

A All exposed or concealed piping, etc., shall be held as high as possible unless otherwise noted and coordinated with all other trades. Exposed piping, insofar as possible, routed perpendicular or parallel to the building structure.

1.13 PREFABRICATED SYSTEMS

A It is the contractor's responsibility to verify fit and function of any contractor prefabricated system prior to fabrication and delivery of system to project site for installation including above and below grade system. If any unforeseen conditions are encountered after the system has been prefabricated rendering system unusable, the contactor will not be compensated for materials and labor of the prefabricated system.

1.14 INSPECTION OF SITE

A Before submitting a proposal on the work contemplated in these specifications and accompanying drawings, each bidder shall examine the site and familiarize themself with all of the existing conditions and limitations. No extras will be allowed because of Contractor's misunderstanding as to the amount of work involved or lack of his knowledge of any condition in connection with the new construction.

1.15 PAVEMENT, CURB AND SIDEWALK REPLACEMENT

A This Contractor shall be responsible for replacement of existing street pavement, curbs, and sidewalks, etc., removed or damaged by them during the course of the work, unless such pavement, curbs, sidewalks are to be constructed under the General Contract. The work shall be done in accordance with local requirements.

1.16 SALVAGE

A All items removed from existing building shall be salvaged in a workmanlike manner.

B The handling, storage, and disposition of salvage materials shall be as directed by the Architect. Generally, all salvage material shall remain the property of the Owner. Materials and equipment not wanted by Owner shall be removed from the job site and become the property of the contractor.

1.17 CODES, ORDINANCES, REGULATIONS & STANDARDS

A The entire installation shall be made in accordance with all state and local laws. If, in any instance, the plans and specifications conflict with such laws, the law shall take precedence. This, however, shall not be construed as relieving the contractor from complying with any requirements of the drawings and specifications that may be in excess of the rules and not contrary to the same.

B All work shall conform to applicable state and local codes, ordinances, regulations and/or standards.

1.18 PERMITS AND LICENSES

A This contractor shall obtain and pay for all licenses and permits and shall pay for all fees and charges for the connection to outside services and use of property other than the site of the work for storage of materials or other purposes.

B Contractor shall coordinate and request all inspections from authority having jurisdiction. The Contractor shall notify the Architect of all such coordinated inspections (date & time) and shall submit certificates of inspection and final approval of the local inspection authority.

1.19 TEST

A Test all equipment installed under these specifications and demonstrate its proper operation to the Engineer.

B Do not test or operate equipment for any purpose, until it has been fully lubricated in accordance with the manufacturer's instructions and, if it is a centrifugal pump, until it has been connected to the piping system with sufficient water so that it will not run dry.

C All testing shall be completed before final inspection, and test results shall be available during the final inspection.

1.20 GUARANTEES

A This contractor shall guarantee all equipment, material, and workmanship for a period of one year from date of final certificate. Any defects in mechanical equipment, workmanship or materials that appear, or cause trouble of any kind within a period of one year from date of final certificate shall be remedied, free of charge. Refer to other sections of these specifications for guarantees in excess of the requirements herein described.

1.21 CONSTRUCTION CLOSEOUT DOCUMENTS

A This Contractor and their subcontractors should proceed immediately to fully complete the work as listed at the end of this Section. The Contractor responsible shall initial and date the "Contractor Completed" column after each item as it is complete and forward a copy of the fully completed punch list to the Engineers for their final approval before final punch list inspection. Reply with an NA where items don't pertain.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

3.2 **INSTRUCTION TO OWNER'S EMPLOYEES FORM**

DATE _____

INSTRUCTION OF OWNER'S EMPLOYEES

This letter shall certify that the Contractor has furnished the Owner with full instructions in the care and operation of all parts of the mechanical system as specified under Section 23 0100 paragraph entitled "Instruction of Owner's Employees".

	Owner's Initial Instructions			**Owner's Follow-up Instructions**		
Section	**Hours**	**Date**	**Initials**	**Hours**	**Date**	**Initials**
Fire Sprinkler						
Fire Pumps						

END OF SECTION

SECTION 21 05 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 SECTION INCLUDES

A Above ground piping.

B Escutcheons.

C Mechanical couplings.

D Pipe hangers and supports.

E Pipe sleeves.

F Pipe sleeve-seal systems.

G Pressure gauges.

1.2 RELATED REQUIREMENTS

A Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.3 REFERENCE STANDARDS

A ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

B ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.

C ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

D ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

E ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

F ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.

G ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

H ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2024.

I ASME B16.11 - Forged Fittings, Socket-Welding and Threaded; 2021.

J ASME B16.25 - Buttwelding Ends; 2022.

K ASME B36.10M - Welded and Seamless Wrought Steel Pipe; 2022.

L ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

M ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2021.

N ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

O ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).

P AWWA C606 - Grooved and Shouldered Joints; 2022.

Q FM (AG) - FM Approval Guide; Current Edition.

R NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

C Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D Installer's qualification statement.

E Project Record Documents: Record actual locations of components and tag numbering.

1.5 QUALITY ASSURANCE

A Designer's qualification statement. The designer shall be a licensed individual and certify the following:
1. The layout is within the scope of the applicable prescriptive codes or standards, such as the National Fire Protection Association (NFPA) Standard 13 "Standard for the Installation of Sprinkler Systems" as specified, or adopted by the state or local jurisdiction.
2. The licensed individual currently holds a valid Responsible Managing Employee License (RME) issued by the Texas State Fire Marshal's Office, in accordance with the Texas Insurance Code Article 5.43-3.
3. The licensed individual is certified to a minimum Level III, in the subfield of "Automatic Sprinkler Systems Layout", through the National Institute for Certification in Engineering Technologies (NICET).
4. Upon completion of the installation a licensed individual, where given the specific authority by Texas Statute, will certify in writing that the installation meets the standards provided for by law and/or is in compliance with the plans and specifications of the licensed professional engineer.

B Comply with FM (AG) requirements.

C Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

D Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.6 DELIVERY, STORAGE, AND HANDLING

A Deliver and store valves in shipping containers, with labeling in place.

1.7 WARRANTY

A See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A Sprinkler-based System:
1. Comply with NFPA 13.
2. See Section 21 13 00.

B Welding Materials and Procedures: Comply with ASME BPVC-IX.

C Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.2 ABOVE GROUND PIPING

A Steel Pipe, above 2-inch: ASTM A53 Schedule 40, black.

1. Steel Fittings: ASME B16.5 steel flanges and fittings.
2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
3. Malleable Iron Fittings: ASME B16.3, threaded fittings.
4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe. ASTM A53F pipe is not allowed in grooved piping.

B Steel Pipe, 2-inch and below: ASTM A53 Schedule 40, black.
1. Steel Fittings: ASME B16.5 steel flanges and fittings.
2. Cast Iron Fittings: ASME B16.4, threaded fittings.
3. Malleable Iron Fittings: ASME B16.3, threaded fittings.
4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe. ASTM A53F pipe is not allowed in grooved piping.

2.3 ABOVE GROUND PIPING, DRY PIPE SYSTEMS

A Steel Pipe, above 2-inch: ASTM A53 Schedule 40, galvanized.
1. Steel Fittings: ASME B16.5 steel flanges and fittings.
2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
3. Malleable Iron Fittings: ASME B16.3, threaded fittings.
4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe. ASTM A53F pipe is not allowed in grooved piping.

B Steel Pipe, 2-inch and below: ASTM A53 Schedule 40, galvanized.
1. Steel Fittings: ASME B16.5 steel flanges and fittings.
2. Cast Iron Fittings: ASME B16.4, threaded fittings.
3. Malleable Iron Fittings: ASME B16.3, threaded fittings.
4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe. ASTM A53F pipe is not allowed in grooved piping.

2.4 PIPE SLEEVES

A Vertical Piping:
1. Sleeve Length: 1 inch above finished floor.
2. Provide sealant for watertight joint.
3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

2.5 PIPE SLEEVE-SEAL SYSTEMS

A Modular Mechanical Seals:
1. Elastomer-based interlocking links to continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
3. Size and select seal component materials in accordance with service requirements.
4. Service Requirements:
   a. Underground, buried, and wet conditions.
5. Glass-reinforced plastic pressure end plates.

B Wall Sleeve: PVC material with waterstop collar, and nailer end caps.

C Sleeve-Forming Disk: Nonconductive plastic-based material, 3 inch thick.

D Pipeline-Casing Seals:

1. Coated-metallic boltless casing-spacer for 4 inch carrier pipe.
2. Coated-metallic boltless modular seal for 6 inch carrier pipe.
3. Carbon steel band with riser for 12 inch carrier pipe.
4. End Seals: 1/8 inch, pull-on type, rubber or synthetic rubber based.

2.6 ESCUTCHEONS

A Material:
1. Metals and Finish: Comply with ASME A112.18.1.

B Construction:
1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.7 PIPE HANGERS AND SUPPORTS

A Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

B Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis or split ring.

C Vertical Support: Steel riser clamp.

2.8 MECHANICAL COUPLINGS

A Manufacturers:
1. ASC Engineered Solutions: www.asc-es.com/#sle.
2. Shurjoint Piping Products, Inc: www.shurjoint.com/#sle.
3. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
4. Victaulic Company: www.victaulic.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B Rigid Mechanical Couplings for Grooved Joints:
1. Dimensions and Testing: Comply with AWWA C606.
2. Minimum Working Pressure:
   a. 8 inch and less: 365 pisg.
   b. Greater than 8 inch: 300 psig.
3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
4. Housing Coating: Factory applied orange enamel.
5. Gasket Material: EPDM Grade E, Type A suitable for operating temperature range from 40 degrees F degrees F to 230 degrees F.
6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.
7. Provide stops for direct stab installation without field assembly.

2.9 PRESSURE GAUGES

A Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

PART 3 EXECUTION

3.1 PREPARATION

A Remove scale and foreign material, from inside and outside, before assembly.

B Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C Install piping to conserve building space, to not interfere with use of space and other work.

D Group piping whenever practical at common elevations.

E Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F Pipe Hangers and Supports:
1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
2. Place hangers within 12 inches of each horizontal elbow.
3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

H Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

I Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

J Manufactured Sleeve-Seal Systems:
1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a watertight seal.
6. Install in accordance with manufacturer's recommendations.

K Escutcheons:
1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

L When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

3.3 CLEANING

A Upon completion of work, clean all parts of the installation.

B Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 21 13 00 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Wet-pipe sprinkler system.

B Dry-pipe sprinkler system.

C System design, installation, and certification.

D Fire department connections.

1.2 REFERENCE STANDARDS

A FM (AG) - FM Approval Guide; Current Edition.

B NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C NFPA 1963 - Standard for Fire Hose Connections; 2019.

D UL (DIR) - Online Certifications Directory; Current Edition.

E UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C Shop Drawings:
1. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
2. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.

D Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

E Designer's qualification statement.

F Installer's qualification statement.

G Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements for additional provisions.
2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
3. Sprinkler Wrenches: For each sprinkler type.

H Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.4 QUALITY ASSURANCE

A Comply with FM (AG) requirements.

B Designer's qualification statement. The designer shall be a licensed individual and certify the following:

1. The layout is within the scope of the applicable prescriptive codes or standards, such as the National Fire Protection Association (NFPA) Standard 13 "Standard for the Installation of Sprinkler Systems" as specified, or adopted by the state or local jurisdiction.
2. The licensed individual currently holds a valid Responsible Managing Employee License (RME) issued by the Texas State Fire Marshal's Office, in accordance with the Texas Insurance Code Article 5.43-3.
3. The licensed individual is certified to a minimum Level III, in the subfield of "Automatic Sprinkler Systems Layout", through the National Institute for Certification in Engineering Technologies (NICET).
4. Upon completion of the installation a licensed individual, where given the specific authority by Texas Statute, will certify in writing that the installation meets the standards provided for by law and/or is in compliance with the plans and specifications of the licensed professional engineer.

C Equipment and Components: Provide products that bear FM (AG) label or marking.

D Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Sprinklers, Valves, and Equipment:
1. Anvil International: www.anvilintl.com/#sle.
2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
3. Victaulic Manufacturing Co; www.victaulic/#sle
4. Viking Corporation: www.vikinggroupinc.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 SPRINKLER SYSTEM

A Sprinkler System: Provide coverage for entire building.

B Occupancy: Light hazard; comply with NFPA 13.

C Water Supply: Determine volume and pressure from water flow test data.

D Provide fire department connections where indicated.

E Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.3 SPRINKLERS

A Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
1. Response Type: Quick.
2. Coverage Type: Standard or Extended.
3. Finish: Enamel, color White unless noted otherwise .
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

B Exposed Area Type: Pendant Pendant or Upright type.
1. Response Type: Quick.
2. Coverage Type: Standard or Extended.
3.
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
1. Response Type: Quick.
2. Coverage Type: Standard or Extended.
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D Dry Sprinklers: Concealed pendant type with matching push on escutcheon plate.
1. Response Type: Quick.
2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

E Guards: Finish to match sprinkler finish.

F Flexible Drop System: Stainless steel, multiple use, open gate type, annular corrigated 1 inch ID hose.
1. Application: Use to properly locate sprinkler heads.
2. Include all supports and bracing.
3. Provide braided, corrigated type tube as required for the application.
4. Manufacturers:
   a. FlexHead Industries, a brand of ASC Engineered Solutions: www.asc-es.com/#sle.
   b. Victaulic Company: www.victaulic.com/#sle.
   c. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 PIPING SPECIALTIES

A Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
1. Activate electric alarm.
2. Test and drain valve.

B Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:
1. Activate electric alarm.
2. Test and drain valve.

C Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.

D Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.

E Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

F Fire Department Connections:
1. Type: Free standing made of corrosion resistant metal complying with UL 405.
   a. Inlets: Storz type connection. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
   b. Finish: Chrome.
   c. Sleeve: Brass, 18 inches height.
   d. Signage: Raised or engraved lettering 1 inch minimum indicating system type.

2.5 AIR COMPRESSOR

A Compressor: Single-unit, electric motor driven, motor, motor starter, safety valves, check valves, air maintenance device incorporating electric pressure switch and unloader valve.

B Electrical Characteristics:
1. 1/3 hp.
2. 125 volts, single phase, 60 Hz.

PART 3 EXECUTION

3.1 INSTALLATION

A Install in accordance with referenced NFPA design and installation standard.

B Install equipment in accordance with manufacturer's instructions.

C Locate outside alarm gong on building wall as indicated.

D Place pipe runs to minimize obstruction to other work.

E Place piping in concealed spaces above finished ceilings.

F Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

G Flush entire piping system of foreign matter.

H Install guards on sprinklers where indicated.

I Hydrostatically test entire system.

J Require test be witnessed by Fire Marshal.

3.2 SCHEDULES

A System Hazard Areas:
1. Offices: Light Hazard.

END OF SECTION

SECTION 22 01 00 - PLUMBING GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 APPLICABILITY

A This section applies to and forms a part of each of the sections of Division 22. This section, and each of the sections to which it applies, is subject to the requirements of the Instructions to Bidders, General Conditions, and Special Conditions of these complete specifications.

B The work covered by this Division of the Specifications consists of furnishing all labor, supervision, equipment, materials, all incidentals, related items, and appurtenances, and performing all operations necessary to complete the installation of work in strict accordance with these specifications and drawings.

C All work shall be finished, tested and ready for operation.

1.2 DEFINITIONS

A Words "Material" or "Furnish" where written in Division 22 specifications and drawings shall mean any and all apparatus, equipment, devices, fixtures, components, products, assemblies, items, parts, things, and any other pieces specified or shown or required.

B Words "Labor" or "Install" where written in Division 22 specifications and drawings shall mean any and all physical effort, manpower, time, expertise, tools, equipment and services to carefully assemble, install and affix all material in a proper, complete and acceptable manner.

C Word "Provide" where written in Division 22 specifications and drawings shall mean "Mechanical Contractor shall furnish all labor and material and completely and properly install such material and leave same in acceptable condition and intended acceptable working order".

1.3 DISCREPANCIES OR OMISSIONS FROM DRAWINGS OR DOCUMENTS

A Notify the Engineer of any discrepancies in, or omissions from the drawings or documents. Neither the Owner nor the Architect will be responsible for any oral instructions or modifications of the specifications or drawings. Written interpretations will be made only by Addenda.

B If discrepancies are not reported, the contractor shall bid the greater quantity or better quality (highest dollar value), and appropriate adjustment will be made after contract award.

C Discrepancies discovered during construction shall immediately be called to the attention of the Architect/Engineer for clarification.

D All minor items necessary for the completion and successful operation of the system, whether or not herein definitely specified or indicated on the drawings, shall be furnished and installed.

E Omission of/or express reference to any material necessary for/or reasonably incidental to complete installation shall not release Contractor from providing such material. Where material is shown on drawings but is not specified or is specified but not shown, such material shall be considered both shown and specified.

F Any work not clear to Contractor shall be referred to Engineer for clarification before bid is submitted. If no question is raised prior to opening of bid, Contractor shall be required to provide work in question as directed by Engineer, whose decision is final, without additional charges.

G By virtue of submitting a bid, Contractor agrees that they are skilled and experienced in use of and in interpretation of drawings and specifications. Contractor further agrees that they have carefully reviewed all drawings, all specifications, and all addenda, which constitute bid documents for this contract, and finds them free of ambiguities and good and sufficient for bidding and construction purposes.

1.4 DRAWINGS

A The drawings indicate the extent and general layout of the mechanical systems intended for the building. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, connections, and accessories which may be required. Furnish offsets, fittings, valves, and accessories as may be required, to produce a complete and operating installation of type shown and specified.

B All piping shall be routed so as not to obstruct access to other equipment (i.e. VAV box controls, electrical devices, fire alarm devices, etc.). Routing indicated on drawings is representative of intended location but shall be field verified. It shall be this contractor’s responsibility to coordinate with other trades for accessibility.

C Any work or system on the roof not explicitly indicated on the roof plan shall be approved by the engineer prior to installing.

D In general, the plumbing equipment drawings are drawn to scale as noted. Obtain dimensions and locations of partitions, walls, etc., from the Architectural drawings wherever possible and do not scale the mechanical drawings. Consult the Architectural drawings for details of construction, location of suspended ceilings, ceiling heights, and other pertinent information. Architect's drawings shall not take precedence over field measurements.

E All drawings and specifications shall be considered in bidding. The drawings and specifications are complimentary, and what is called for in either of these shall be as binding as though called for by both. Should any conflict arise between drawings and specifications, such conflict shall be brought to the attention of the Architect.

1.5 EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

A When any Contractor submits approval of materials and/or equipment of different physical size, weight, capacity, electrical characteristics, function, color, access, it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc.

B In all cases where substitutions or deviations affect other trades, the Contractor requesting or submitting such substitutions shall advise all such Contractors of the change and shall compensate them for all necessary changes in their work. In the event that a substitution or deviation is approved, it is the submitting contractor's responsibility to coordinate any changes with the effected contractors. Any drawings, specifications, diagram, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense.

1.6 PRIOR APPROVAL REQUEST

A Requests for substitution of materials and/or equipment other than those named in the specifications may be made to the Architect/Engineer. The request shall include complete information, test, etc. relating to quality, performance, and suitability. All requests shall be in the Architects/Engineers office not later than ten (10) days prior to the Bidding date. All approved requests shall be included in the project addenda.

1.7 INSTRUCTION OF OWNER’S EMPLOYEES

A Furnish, without additional expense to the Owner, the services of competent instructors, who will give full instructions in the care, adjustment, and operation of all parts of the mechanical equipment to the Owner's employees who are to have charge of the equipment.

B An operating and maintenance manual shall be made available to the Owner's operating personnel during the instruction and left with the Owner upon completion of the instruction.

C The number of man hours of instruction furnished for each system shall be as specified below. Hours of instruction shall be divided up into a minimum of two (2) instruction periods with 75% of time used for an initial instruction and 25% of time used for a follow up instruction, a minimum of four (4) weeks after initial instruction.

D Instruction of Owner's Employees" form at end of this section shall be filled out and signed by Contractor and Owner's Representative and three (3) signed copies of form sent to Engineer.

E Owner training and instructions:
1. Ventilation systems including but not limited to packaged rooftop units shall not be less than four (4) man hours.
2. Automatic temperature control systems including all components of the system shall be not less than eight (8) man hours.

1.8 INSTALLATION OF EQUIPMENT

A All appliances and equipment shall be installed and connected in accordance with manufacturer's instructions and recommendations unless such instructions are in conflict with these specifications. Auxiliary piping, valves, electrical connections, etc., recommended by the manufacturer or required for proper operation shall be furnished and installed complete.

B All equipment shall be installed in such a manner and location as to facilitate accessibility for maintenance and/or replacement.

C As a part of the work of this contract, the Contractor shall make any changes in the pulleys, belts, and dampers, and shall install additional dampers required for correct balance as recommended by air balance agency, at no additional cost to the Owner.

D The use of permanent HVAC systems for temporary heating, cooling, ventilating, and conditioning is strictly prohibited without written authorization from the Engineer.

1.9 RECORD DRAWING

A The contractor shall maintain one set of drawings at the job site used as a master copy. Each change order or other revision, deletion, or addition shall be clearly marked and noted by colored pencil. This copy of plans shall be furnished to the Architect upon completion of the project.

B The contractor shall note on the record drawings the elevations and/or inverts of all mechanical services (i.e., sewer, water, etc.) where they exit the building foundation. The contractor shall also record dimensions from the building to points on all mechanical equipment installed (ie., fuel tanks, oil piping, etc.).

C A complete set of these drawings shall be scanned at a resolution of 600dpi in color and saved in an Adobe PDF portfolio format with index to each sheet by name and burned to a non-volatile media. The electronic copy of the as-built drawings shall be transmitted to the Architect. After review and approval by the Architect, the as-built drawings will be turned over to the Owner.

1.10 COOPERATION WITH OTHER TRADES

A Cooperate with other trades so as to avoid interferences. Where required to avoid interferences with other work or to increase the headroom, the Contractor shall off-set the piping and/or re-route the duct work where directed by the Engineer. Carefully check all construction details to assure the proper installation of all work under this specification. Schedule the work such that it will keep pace with the work of other crafts and cause no delay.

B The Contractor shall furnish to other trades, as required, all necessary electrical characteristics, templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.11 EQUIPMENT SUPPORT

A Each piece of equipment, apparatus, piping, or conduit suspended from the ceiling or mounted above the floor level shall be provided with suitable structural support, pipe stand, platform or carrier in accordance with the best recognized practice. Such supporting or mounting means shall be provided by the Contractor for all equipment and piping. Exercise extreme care that structural members of building are not overloaded by such equipment. Provide any required additional bracing, cross members, angles, support, etc.

1.12 PIPE MOUNTING HEIGHTS

A All exposed or concealed piping, etc., shall be held as high as possible unless otherwise noted and coordinated with all other trades. Exposed piping and ductwork shall, insofar as possible, routed perpendicular or parallel to the building structure.

1.13 PREFABRICATED SYSTEMS

A It is the contractor's responsibility to verify fit and function of any contractor prefabricated system prior to fabrication and delivery of system to project site for installation including above and below grade system. If any unforeseen conditions are encountered after the system has been prefabricated rendering system unusable, the contactor will not be compensated for materials and labor of the prefabricated system.

1.14 INSPECTION OF SITE

A Before submitting a proposal on the work contemplated in these specifications and accompanying drawings, each bidder shall examine the site and familiarize themself with all of the existing conditions and limitations. No extras will be allowed because of Contractor's misunderstanding as to the amount of work involved or lack of his knowledge of any condition in connection with the new construction.

1.15 PAVEMENT, CURB AND SIDEWALK REPLACEMENT

A This Contractor shall be responsible for replacement of existing street pavement, curbs, and sidewalks, etc., removed or damaged by them during the course of the work, unless such pavement, curbs, sidewalks are to be constructed under the General Contract. The work shall be done in accordance with local requirements.

1.16 SALVAGE

A All items removed from existing building shall be salvaged in a workmanlike manner.

B The handling, storage, and disposition of salvage materials shall be as directed by the Architect. Generally, all salvage material shall remain the property of the Owner. Materials and equipment not wanted by Owner shall be removed from the job site and become the property of the contractor.

1.17 CODES, ORDINANCES, REGULATIONS & STANDARDS

A The entire installation shall be made in accordance with all state and local laws. If, in any instance, the plans and specifications conflict with such laws, the law shall take precedence. This, however, shall not be construed as relieving the contractor from complying with any requirements of the drawings and specifications that may be in excess of the rules and not contrary to the same.

B All work shall conform to applicable state and local codes, ordinances, regulations and/or standards.

1.18 PERMITS AND LICENSES

A This contractor shall obtain and pay for all licenses and permits and shall pay for all fees and charges for the connection to outside services and use of property other than the site of the work for storage of materials or other purposes.

B Contractor shall coordinate and request all inspections from authority having jurisdiction. The Contractor shall notify the Architect of all such coordinated inspections (date & time) and shall submit certificates of inspection and final approval of the local inspection authority.

1.19 TEST

A Test all equipment installed under these specifications and demonstrate its proper operation to the Engineer.

B Do not test or operate equipment for any purpose, until it has been fully lubricated in accordance with the manufacturer's instructions and, if it is a centrifugal pump, until it has been connected to the piping system with sufficient water so that it will not run dry.

C Submit to the Engineer water balance reports indicating test results as hereinafter specified under Section 230593 "TESTING, ADJUSTING AND BALANCING FOR HVAC".

D All testing shall be completed before final inspection, and test results shall be available during the final inspection.

1.20 GUARANTEES

A This contractor shall guarantee all equipment, material, and workmanship for a period of one year from date of final certificate. Any defects in mechanical equipment, workmanship or materials that appear, or cause trouble of any kind within a period of one year from date of final certificate shall be remedied, free of charge. Refer to other sections of these specifications for guarantees in excess of the requirements herein described.

1.21 CONSTRUCTION CLOSEOUT DOCUMENTS

A This Contractor and their subcontractors should proceed immediately to fully complete the work as listed at the end of this Section. The Contractor responsible shall initial and date the "Contractor Completed" column after each item as it is complete and forward a copy of the fully completed punch list to the Engineers for their final approval before final punch list inspection. Reply with an NA where items don’t pertain.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 **INSTRUCTION TO OWNER'S EMPLOYEES FORM**

DATE _____

INSTRUCTION OF OWNER'S EMPLOYEES

This letter shall certify that the Contractor has furnished the Owner with full instructions in the care and operation of all parts of the mechanical system as specified under Section 23 0100 paragraph entitled "Instruction of Owner's Employees".

	Owner's Initial Instructions			**Owner's Follow-up Instructions**		
Section	**Hours**	**Date**	**Initials**	**Hours**	**Date**	**Initials**
Special Piping						
Water Heaters						
Medical Gas						
Water Purification						
Pumps						

	Control Systems						

3.2 NOT USED

END OF SECTION

SECTION 22 01 20 - PLUMBING SHOP DRAWINGS AND SUBMITTALS

PART 1 GENERAL

1.1 SHOP DRAWINGS

A Contractor shall submit for acceptance to the Architect shop drawings specified for the equipment indicated in these specifications. The shop drawings shall include the following minimum information:
1. The equipment manufacturer's name and address.
2. Catalog designation or model number.
3. Rough-in data & dimensions.
4. Performance curves and rated capacities & operational characteristics.
5. Equipment specific wiring diagrams.
6. Electrical characteristics.
7. Warranty information.

B All submittals shall be electronic in PDF format, hard copies will not be accepted.

C The Contractor shall thoroughly review each item for compliance with these Specifications making any necessary corrections prior to submittal. Each shop drawing set shall be stamped, signed, and dated indicating Contractor review.
1. If the Contractor fails to properly review shop drawings, the Contractor shall reimburse the Engineer for all additional reviews on a time and material basis.

D Specification Compliance Certification: Where this Section and other Sections of this Division require Specification Compliance Certification to be submitted, comply with the following:
1. Prepare a line-by-line Specification Compliance Certification by marking up a copy of the Contract Document specification section in the left margin. Accompany the markup with a written report explaining all items that are not marked with "Compliance". Submit line-by-line markup, written report of deviations and alternates and a cover letter certified by Manufacturer or Installer that prepared the Specification Compliance Certification. Use the following key for preparing the line-by-line markup.
   a. "C" for Compliance: By noting the term "compliance" or "C" in the margin, it shall be understood that the manufacturer is in full compliance with the item specified and will provide exactly the same with no deviations.
   b. "D" for Deviation: By noting the term "deviation" or "D" in the margin, it shall be understood that the manufacturer prefers to provide a different component in lieu of that specified.
   c. "A" for Alternate: By noting the term "alternate" or "A" in the margin, it shall be understood that the manufacturer proposes to provide the same operating function but prefers to do it in a different manner.
   d. "N/A" for Not Applicable: By noting the term "not applicable" or "N/A" in the margin, it shall be understood that the specified item is not applicable to the project.

E Provide samples of materials or equipment proposed to be furnished, if requested. Samples shall become the property of the Architect/Engineer and will be returned only when accompanied by a written request to do so.

F None of the items listed shall be purchased, delivered to the site, or installed, until the item is reviewed. No substitution will be permitted after review except where such substitution is considered by the Architect to be in the best interest of the Owner.

G The Engineer will review all Shop Drawings submitted.

H Approval Stamp: This review is to verify general conformance with the design concept of the Project and substantial compliance with the information provided in the Contract Documents. This review does not in any way relieve the Contractor or their suppliers of their responsibility to provide all materials and equipment as specified, in quantities, quality and dimensions required. Submittals will be reviewed with the following actions:

1. “Reviewed” indicates that the Submittal appears to conform to the design concept of the Work and that the Contractor, at their discretion, may proceed with fabrication and/or procurement and installation. Shop drawings that are returned "Reviewed" or "Furnished as Corrected" shall not be resubmitted back to the engineer and if submitted will not be reviewed.
2. “Furnished as Corrected” indicates that the Submittal, after noted corrections are made, appears to conform to the design concept of the Work and that the Contractor, at their discretion, may proceed with fabrication and/or procurement and installation, if the corrections are accepted by the Contractor without any increase in Contract Sum or Time. If the corrections are accepted by the contractor, shop drawings that are returned "Furnished as Corrected" shall not be resubmitted back to the engineer and if submitted will not be reviewed.
3. “Revised and Resubmit” indicates that the noted revisions are such that a corrected copy of the Submittal is required for review to confirm that the noted revisions have been understood and made. The Contractor, at their discretion, may proceed with fabrication and/or procurement and installation after submitting a corrected copy and verifying with the reviewer that the corrected copy is acceptable, if the corrections are accepted by the Contractor without an increase in the Contract Sum or Time.
4. “Rejected” indicates that the Submittal does not appear to conform to the specifications, a resubmission is required, and fabrication or procurement is not authorized.

I If the Engineer rejects (Revised and Resubmit or Rejected) the same section two times the engineer shall be compensated for additional reviews. Contractor is responsible for all delays caused by the resubmittal process.

J Should the contractor fail to comply with any of the requirements of the preceding sub-paragraphs; then the right is reserved by the Architect to select any or all items in the material schedule, with that selection to be final and binding upon the contractor. The materials selected or reviewed, as the case may be, by the Architect, shall be used in the work at no additional cost to the Owner.

K When any Contractor submits approval of materials and/or equipment of different physical size, weight, capacity, electrical characteristics, function, color, access, it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc.

L In all cases where substitutions or deviations affect other trades, the Contractor requesting or submitting such substitutions shall advise all such Contractors of the change and shall compensate them for all necessary changes in their work. In the event that a substitution or deviation is approved, it is the submitting contractors responsibility to coordinate any changes with the effected subcontractors. Any drawings, specifications, diagram, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense.

1.2 EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

A When any Contractor submits approval of materials and/or equipment of different physical size, weight, capacity, electrical characteristics, function, color, access, it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc.

B In all cases where substitutions or deviations affect other trades, the Contractor requesting or submitting such substitutions shall advise all such Contractors of the change and shall compensate them for all necessary changes in their work. In the event that a substitution or deviation is approved, it is the submitting contractors responsibility to coordinate any changes with the effected subcontractors. Any drawings, specifications, diagram, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense.

1.3 SPECIAL WRENCHES, TOOLS AND KEYS

A Each Contractor shall provide, along with the equipment provided, any special wrenches or tools necessary to dismantle or service equipment or appliances installed by him. Wrenches shall include necessary keys, handles and operators for valves, switches, breakers, etc. and keys to electrical panels, alarm pull boxes and panels, etc. At least two of any such special wrench, keys, etc. shall be turned over to the Architect prior to completion of the project. Obtain a receipt that this has been accomplished and forward a copy to the Engineer.

1.4 MANUALS

A In addition to catalog data and shop drawings submitted for review, this contractor shall furnish Systems Manuals (O&M's):

1. The Contractor Shall provide an electronic copy in PDF format. The PDF shall contain:
   a. Approved Shop Drawings of all major components.
   b. Parts lists for the same components.
   c. Manufacturer's operating, maintenance, and cleaning instructions.
   d. List of materials recommended for maintenance.
   e. Factory startup reports.
   f. Valve tag list.
   g. Name and address of authorized service organization and parts depot.
   h. Chemical Treatment Analysis Reports for heating & cooling systems.
   i. Radiographic Testing Reports of welded pipe with picture of weld & location plan showing physical location of where test was performed.
   j. A description of how the components of a given HVAC system interact within the large system. For example, circulating pumps, boilers, unit heaters are part of the "heating system".
   k. A description of normal operating conditions for the system and its components.
   l. A description of common symptoms of a malfunctioning system and likely causes.
   m. Warranty letter from the automatic temperature controls contractor indicating the warranty period for their portion of the work.
   n. Signed owner instruction forms for all items specified as requiring owners' instruction.
2. The Systems manual shall have an electronic index and be broken up by individual systems such as "heating", "shop exhaust", "kitchen ventilation and exhaust", "chilled water", "administration ventilation".
3. Include at the front of the manual a complete listing of the Architect, Engineer and contractors and sub-contractors used on the project. Listing shall include names, addresses and phone numbers for each.
4. All major pieces of equipment shall be referenced with the equipment supplier's name, address and phone number shall be provided.
5. Where indicated in the Specifications, the Contractor shall provide the services of a factory trained representative to instruct the Owner's authorized personnel in the operation, control, and maintenance of equipment.

B Operations and Maintenance Manuals shall be submitted to the Engineer for approval prior to delivery to the Architect.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 22 01 50 - PLUMBING AND PIPING MATERIALS AND METHODS

PART 1 GENERAL

1.1 APPLICABILITY

A This section covers basic materials and methods and applies to and forms a part of each of the sections of Division 22.

B This work shall be in accordance with this and other applicable sections and/or provisions of these specifications and with the applicable drawings.

1.2 MATERIALS AND MANUFACTURERS

A All materials and equipment shall be new, free of defects, installed in accordance with manufacturer's current published recommendations in a neat manner and in accordance with standard practice of the industry.

B Certain materials and/or equipment in this specification are specified by manufacturer and catalog numbers. The design was based on the specified equipment and establishes a degree of quality, performance, physical configuration, etc. If the contractor should elect to use equipment other than the equipment used as a basis for design but listed as "acceptable" in the specifications, he shall be responsible for space requirements, configuration, performance, and changes in bases, supports, vibration isolators, structural members, openings in structure and other apparatus that may be affected by its use.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 COORDINATION OF OPENINGS

A This contractor shall coordinate all openings required for new piping, equipment, controls, etc. through any structural slabs, beams, or walls. Contractor shall request a copy of the precast concrete shop drawings and verify locations and sizes of all openings required.

B All costs associated with structural field changes or redesigns of the building systems due to lack of field coordination shall be responsibility of this contractor.

3.2 PIPE AND FITTING INSTALLATION

A Plastic DWV piping shall be installed as addressed by ICC (IPC) or IAPMO (UPC) code section on Expansion and Contraction. Any straight runs of plastic DWV piping exceeding 30 feet shall be installed to accommodate thermal expansion.

B Piping is to be installed as shown on the drawings as much as practical. When a pipe size is not indicated, the subcontractor shall request the pipe size from the Architect through the Plumbing Contractor.

C Provide sufficient swing joints, expansion loops, and/or devices necessary and install so as to permit free expansion and contraction of piping without causing undue stresses. Make all changes in direction with fittings. Support piping independently at all equipment so that its weight shall not be supported by the equipment.

D Install piping without springing or forcing and clear all windows, doors, and other openings. Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted.

E All pipes shall be reamed to full pipe diameter before joining.

F Install vertical risers plumb and straight, horizontal lines parallel with walls and partitions. Conceal piping above ceilings and within furring and/or walls when practical.

G Provide shut-off valves and unions suitably located to isolate each item of equipment, branch circuit or section of piping.

H Provide 1/2" drain valves at all low points of each system to enable complete drainage.

I Provide "Clearflow" dielectric waterways at all junctions of dissimilar metals in potable water systems.

J All piping shall be adequately supported from the building structure with adjustable hangers to maintain uniform grading where required and to prevent sagging or pocketing.

K Provide supports between piping and building structure where necessary to prevent swaying.

L The use of wire or perforated metal to support pipe will not be permitted.

3.3 PROTECTION, DELIVERY AND STORAGE OF MATERIALS

A Make provisions for the delivery and storage of materials and make the required arrangements with other contractors for the introduction into the building of equipment too large to pass through finished openings.

B Protect materials and equipment stored on site from weather and moisture by maintaining factory covers and/or suitable weather-proof coverings. For extended outdoor storage, motors shall be removed from equipment and stored separately.

C The open ends of all piping shall be covered whenever that system is not being worked on, i.e. end of the workday, completion of a section, etc. Covering shall keep dust, garbage, vermin, and other foreign objects out of the piping when the contractor is not on the jobsite.

3.4 CUTTING AND REPAIRING

A All holes and penetrations required for the installation of the plumbing equipment shall be by the plumbing contractor. This shall include all piping, ductwork, and any other penetration through the wall, floor, or roof.

B Cutting construction shall be done only with the written permission of the Architect. Cutting shall be done carefully and damage to buildings, pipes, wiring, or equipment as a result of cutting for installation shall be repaired by skilled mechanics of the trade involved at no additional charge to the Owner. This Contractor shall be responsible for all cutting and patching unless such work has been delegated to the General Contractor.

C All holes cut into concrete shall be cut by means of power saws or core drills. All unsightly spalls or chips shall be repaired.

D All openings remaining around duct and pipe penetrations shall be filled, caulked, and painted to match wall. Code approved fire caulking shall be used for all rated penetrations.

3.5 SEALING FLOOR, CEILINGS AND WALL OPENINGS

A Where pipes pass through walls, ceilings, floors, or partitions, (other than those through fire rated walls or chases) the opening in the construction around the pipe shall not exceed ½ inch average clearance on all sides and shall be sealed to prevent the passage of sound and air. Coordinate wall openings to allow insulation thickness to pass through walls if allowed.

B The material used to seal space between the wall and the pipe shall be non-combustible caulk type, or wrap type, as conditions require. Provide sheet metal angles or flanges as may be required to contain the stopping material. Use of expanding foam will be allowed if surfaces are cleaned of an excess material and all edges are trimmed smooth. Penetrations through exterior walls shall be sealed weather tight.

C Special attention shall be given to penetrations of mechanical room walls. Fill gaps around entire exterior area of the pipes with sound insulation (batt or mineral wool) to within ½" of the wall surface. Use silicone caulking to finish filling the opening smooth with the wall surface or provide sheet metal angles. All sealer shall meet flame spread 25 and smoke developed less than 50.

D Where pipes pass through fire-rated walls, ceilings, floors, vertical service shafts walls, or partitions, the opening in the construction around the pipe or duct shall be fire-stopped to prevent the passage of flame and smoke. All assemblies shall be UL or ASTM listed to provide a fire rating equal to that of the construction being penetrated. For the firestop applications that exist for which no UL tested system is available through a manufacturer, an engineering judgment derived from similar UL system designs or other tests shall be submitted from the manufacturer to the local authorities having jurisdiction for their review and approval prior to installation. Individuals installing the firestopping shall be experienced and certified as required by the manufacturer whose product is being applied. Refer to firestopping spec section for reposition finned element to be centered under windows as required.more information.

E Manufacturer's assembly drawings shall be provided in O & M Manuals for each type of penetration. Printed metal or plastic labels shall be permanently applied on the structure within 6" of the edge of the firestop system. Metal labels shall be applied with mechanical fasteners & plastic labels shall be the self-adhering type with adhesive capable of permanently bonding labels to the surfaces on which the labels are placed. The information required on the label include UL/ASTM assembly number, date of installation, fire stopping material manufacture name, Contractor's name, address & phone number & the installer's name.

F Acceptable manufacturers shall be Hilti, 3M Brand, or a prior approved product.

3.6 CLEANING AND PAINTING

A Clear away all debris, surplus materials, etc., resulting from work or operations, leaving the job and equipment furnished under this contract in a clean condition.

B All equipment being furnished with finished paint coat shall be examined upon job completion for scratches and other surface damage. All finished surfaces where necessary shall be touched up with touch-up paint of color to match the factory finish.

C Paint all exposed bare pipe exterior of the building. Bare pipe shall be painted one coat of No. 7769402 damp-proof red primer as manufactured by Rust-Oleum Corporation, or equal, and one coat of oil paint. Final coat shall be of a color selected by the architect.

D Paint all exposed iron and steel work, pipe hangers, pipe stands, uninsulated tanks, supporting steel for equipment and exposed bare pipe in mechanical areas. Iron and steel work and bare pipe shall be painted one coat of No. 4769402 damp-proof red primer as manufactured by Rust-Oleum Corporation, or equal, and one coat of oil paint. Iron and steel work shall be painted black.

E Refer to Section 09 900, Painting for additional requirements.

3.7 ASBESTOS FREE BUILDING

A There shall be no products or building materials used as a temporary or permanent element in the construction of this building, which has in its make-up any form of asbestos. The contractors shall be responsible to monitor shop drawings and product literature to verify the make-up of materials to be used in the building and remind material suppliers that their products must be asbestos free.

B Notify the Architect immediately of any existing materials which are suspected of containing asbestos. Do not disturb or attempt to remove any asbestos containing material. The Architect will contact the Owner and inform them of the Contractors observations. The Owner will obtain and provide the services of professionals skilled in asbestos removal.

3.8 SALVAGE

A All items removed from existing building shall be salvaged in a workmanlike manner.

B The handling, storage, and disposition of salvage materials shall be as directed by the Architect. Generally, all salvage material shall remain the property of the Owner. Materials and equipment not wanted by Owner shall be removed from the job site and become the property of the contractor.

END OF SECTION

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A Prefabricated trapeze-framed systems.

B Strut systems for pipe or equipment support.

C Beam clamps.

D Pipe hangers.

E Pipe supports, guides, shields, and saddles.

1.2 RELATED REQUIREMENTS

A Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B Section 05 50 00 - Metal Fabrications.

1.3 REFERENCE STANDARDS

A ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

L ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

M FM (AG) - FM Approval Guide; Current Edition.

N MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

O UL (DIR) - Online Certifications Directory; Current Edition.

P UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

C Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.

B Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

D Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

E Materials for Metal Fabricated Supports: Comply with Section 05 50 00.
1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

F Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

2.2 PREFABRICATED TRAPEZE-FRAMED SYSTEMS

A Prefabricated Trapeze-Framed Metal Strut Systems:
1. Strut Channel or Bracket Material:
a. Indoor Dry Locations: Use zinc-plated steel or galvanized steel.

b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

2. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

B Roof Piping Support System:

1. Manufacturer: Eaton, Dura-Blok DB series or equal.
2. Materials:
   a. Curb Base: Rubber and polyurethane prepolymer with a uniform load capacity of 500 punds per linear foot of support.
   b. Dimensions: 6 inch wide, height and lenght as required.
   c. Steel Frame: Steel, strut galvanized per ASTM A653/A653M or strut galvanized per ASTM A653/A653M for bridge series.
   d. Steel, strut galvanized per or strut galvanized per ASTM A653 for bridge series.
   e. Attaching Hardware: Zinc-plated threatded rod, nuts and attaching hardware per ASTM B633.

2.3 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

A Strut Channels:

1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

B Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.
2. Minimum Size, Unless Otherwise Indicated or Required:
   a. Equipment Supports: 1/2 inch diameter.
   b. Piping up to 1 inch: 1/4 inch diameter.
   c. Piping larger than 1 inch: 3/8 inch diameter.
   d. Trapeze Support for Multiple Pipes: 3/8 inch in length.

C Channel Nuts:

1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

2.4 BEAM CLAMPS

A MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.

B C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.

C Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).

D Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.

E Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.

F FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish.

G Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

H Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.5 PIPE HANGERS

A Band Hangers, Adjustable:

1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

B Clevis Hangers, Adjustable:
1. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.

2.6 PIPE CLAMPS

A Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.

B Extension Split Pipe Clamp:
1. MSS SP-58 type 12, hinged split ring and yoke roller hanger with epoxy copper or plain finish.
2. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
3. Provide hanger rod and nuts of the same type and material for a given pipe run.
4. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

C Strut Clamps:
1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.

2.7 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B Stanchions:
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.

C U-Bolts:
1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.

D Pipe Shields for Insulated Piping:
1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
2. General Construction and Requirements:
   a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
   b. Shields Material: UV-resistant polypropylene with glass fill.
   c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
   d. Service Temperature: Minus 40 to 178 degrees F.
   e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

E Pipe Supports:
1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
2. Liquid Temperatures Up to 122 degrees F:
   a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
   b. Support From Below: MSS SP-58 types 35 through 38.

F Pipe Supports, Thermal Insulated:
1. General Requirements:
   a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
c. Provide pipe supports for 1/2 to 30 inch iron pipes.
d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.

2. PVC Jacket:
a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
c. Minimum Thickness: 60 mil, 0.06 inch.

PART 3 EXECUTION

3.1 INSTALLATION

A Install products in accordance with manufacturer's instructions.

B Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

H Equipment Support and Attachment:
1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I Secure fasteners according to manufacturer's recommended torque settings.

J Remove temporary supports.

END OF SECTION

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A Tags.

B Pipe markers.

C Ceiling tacks.

1.2 RELATED REQUIREMENTS

A Section 09 91 23 - Interior Painting: Identification painting.

1.3 REFERENCE STANDARDS

A ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Schedules:
1. Submit plumbing component identification schedule listing equipment, piping, and valves.
2. Detail proposed component identification data in terms of of wording, symbols, letter size, and color coding to be applied to corresponding product.
3. Valve Data Format: Include id-number, location, function, and model number.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A Equipment: Nameplate and Ceiling tack when located above ceiling.

B Piping: Stencile or Pipe Marker.

C Valves, (manual and control type): Valve Tag and Ceiling tack when located above ceiling.

2.2 TAGS

A Metal: Brass, 19 gauge 1-1/2 inch in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

B Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

2.3 PIPE MARKERS

A Comply with ASME A13.1.

B Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.

C Identification Scheme, ASME A13.1:
1. Primary: External Pipe Diameter, Uninsulated or Insulated.
   a. 1-1/2 to 2 inches: Use 8 inch field-length with 3/4 inch text height.
   b. 2-1/2 to 6 inches: Use 12 inch field-length with 1-1/4 inch text height.
2. Secondary: Color scheme per fluid service.
   a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

2.4 CEILING TACKS

A Description: Adhesive backed 3/4 inch diameter sticker, color coded.

B Color code as follows:
1. Plumbing Equipment: Yellow.
2. Plumbing Valves: Green.

PART 3 EXECUTION

3.1 INSTALLATION

A Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B Install tags in clear view and align with axis of piping

C Apply ASME A13.1 Pipe Marking Rules:
1. Place pipe marker adjacent to changes in direction.
2. Place pipe marker adjacent each valve port and flange end.
3. Place pipe marker at both sides of floor and wall penetrations.
4. Place pipe marker every 25 to 50 feet interval of straight run.

D Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A Flexible elastomeric cellular insulation.

B Glass fiber insulation.

C Jacketing and accessories.

1.2 REFERENCE STANDARDS

A ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

B ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).

C ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

D ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

E ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

F ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

G ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

H ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

I UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER INSULATION

A Manufacturers:
1. CertainTeed Corporation: www.certainteed.com/#sle.
2. Johns Manville Corporation: www.jm.com/#sle.

3. Knauf Insulation: www.knaufinsulation.com/#sle.
4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

B Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
1. K Value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum Service Temperature: 650 degrees F.
3. Maximum Moisture Absorption: 0.2 percent by volume.

C Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm.

D Vapor Barrier Lap Adhesive: Compatible with insulation.

E Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.3 GLASS FIBER, FLEXIBLE

A Manufacturer:
1. CertainTeed Corporation: www.certainteed.com/#sle.
2. Johns Manville: www.jm.com/#sle.
3. Knauf Insulation: www.knaufinsulation.com/#sle.
4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

B Insulation: ASTM C553; flexible, noncombustible blanket.

C Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with pressure-sensitive tape.

D Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

E Indoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

2.5 JACKETING AND ACCESSORIES

A Aluminum-Foil Laminate Jacket:
1. Factory-applied, pressure sensitive adhesive jacketing on paper release liner.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that piping has been tested before applying insulation materials.

B Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C Exposed Piping: Locate insulation and cover seams in least visible locations.

D For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

E Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert Location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

3.3 SCHEDULES

A Plumbing Systems, Metallic:
1. Domestic Hot Water Supply and Recirculation:
   a. Glass Fiber Insulation:
      1) Pipe Size Range: 1/2 inch and greater.
      2) Thickness: 1 inch.
2. Domestic Cold Water:
   a. Piping located above ceiling or with-in interior walls
      1) Insulation not required.
   b. Piping located with-in exterior walls:
      1) 3/4 inch thick flexible elastomeric cellular insulation.
3. Roof Drain Bodies:
   a. Glass Fiber Insulation, Flexible or Ridge:
      1) Pipe Size Range: All sizes.
      2) Thickness: 1 inch.
4. Roof Drainage Piping, Above Slab Horizontal Exposed:
   a. Glass Fiber Insulation, Semi-Ridged:
      1) Pipe Size Range: All pipe sizes.
      2) Thickness: 1 inch.
5. Roof Drainage Piping, Above Slab Horizontal Concealled:
   a. Glass Fiber Insulation, Flexible:
      1) Pipe Size Range: All pipe sizes.
      2) Thickness: 1 inch.

B PEX Piping Systems, Return Air Plenum Applications: Above ceiling conditions are considered a return air plenum, insulate individual fittings per manufacture requirements for plenum return applications and the following minimum requirements.
1. Domestic Hot Water Supply and Recirculation Piping
   a. Glass Fiber Insulation:
      1) Pipe Size Range: 1/2 inch and greater.
      2) Thickness: 1/2 inch.
2. PEX Fittings: Glass fiber insulation per PEX manufacturer requirements.
3. Piping located in exterior walls: Insulation is not required.

END OF SECTION

SECTION 22 10 05 - PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A Sanitary waste piping, buried within 5 feet of building.

B Sanitary waste piping, above grade.

C Chemical-resistant sanitary waste piping.

D Domestic water piping, buried within 5 feet of building.

E Domestic water piping, above grade.

F Storm drainage piping, buried within 5 feet of building.

G Storm drainage piping, above grade.

H Natural gas piping, buried beyond 5 feet of building.

I Natural gas piping, buried within 5 feet of building.

J Natural gas piping, above grade.

K Pipe flanges, unions, and couplings.

L Pipe hangers and supports.

M Ball valves.

N Butterfly valves.

O Balancing valves.

P Pressure reducing valves.

Q Pressure relief valves.

R Pressure-temperature valves.

S Strainers.

1.2 RELATED REQUIREMENTS

A Section 22 05 53 - Identification for Plumbing Piping and Equipment.

B Section 22 07 19 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

A ANSI LC 1/CSA 6.26 - Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing; 2019.

B ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).

C ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

D ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

E ASME B16.12 - Cast Iron Threaded Drainage Fittings; 2025.

F ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

G ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

H ASME B31.1 - Power Piping; 2022.

I ASME B31.9 - Building Services Piping; 2020.

J ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2023.

K ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Potable Water Distribution Systems; 2020.

L ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

M ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

N ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.

O ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2019a.

P ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

Q ASTM A674 - Standard Practice for Polyethylene Encasement for Ductile Iron Pipe; 2022.

R ASTM B32 - Standard Specification for Solder Metal; 2020.

S ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

T ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

U ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

V ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.

W ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

X ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.

Y ASTM C1540 - Standard Specification for Heavy-Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.

Z ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2020.

AA ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.

BB ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2020.

CC ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2020.

DD ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2019a.

EE ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.

FF ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2021.

GG ASTM D3222 - Standard Specification for Unmodified Poly(Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials; 2021.

HH ASTM D3311 - Standard Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns; 2017 (Reapproved 2021).

II ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

JJ ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2023.

KK ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 2023.

LL ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2022.

MM ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2024.

NN ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2024.

OO ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing; 2023b.

PP AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

QQ AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2017.

RR AWWA C606 - Grooved and Shouldered Joints; 2022.

SS AWWA C651 - Disinfecting Water Mains; 2014, with Addendum (2020).

TT CAN/ULC-S102.2 - Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies; 2019 Revised.

UU CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.

VV CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

WW FM 1680 - Approval Standard for Couplings Used in Hubless Cast Iron Systems for Drain, Waste or Vent, Sewer, Rainwater or Storm Drain Systems Above and Below Ground, Industrial/ Commercial and Residential; 1989.

XX MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

YY MSS SP-67 - Butterfly Valves; 2022.

ZZ MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

AAA NFPA 54 - National Fuel Gas Code; 2021.

BBB NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces; Current Edition.

CCC NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

DDD NSF 372 - Drinking Water System Components - Lead Content; 2022.

EEE PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe; 2021.

FFF UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

GGG UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.5 QUALITY ASSURANCE

A Perform work in accordance with applicable codes.

B Valves: Manufacturer's name and pressure rating marked on valve body.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.2 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A Cast Iron Pipe: ASTM A74 extra heavy weight.
1. Fittings: Cast iron.
2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B PVC Pipe: ASTM D2665 or ASTM D3034.
1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.3 SANITARY WASTE PIPING, ABOVE GRADE

A Cast Iron Pipe: CISPI 301, hubless, service weight.
1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B PVC Pipe: ASTM D2665.
1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.4 CHEMICAL-RESISTANT SANITARY WASTE PIPING

A CPVC Pipe: ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.
1. Plenum Fire Wrap: 3M Fire Barrier Plenum Wrap 5A+ tested to ASTM E84 and NFPA 262.
   a. Wrap all piping installed in return air plenum.

B CPVC-CW Schedule 40 Pipe and Fittings: (Only where allowed by Local Authority Having Jurisdiction) CVPC-CW may be used anywhere above slab, including return air plenum ceiling spaces. Fire seal all pipe penetrations in fire-rated walls and where pipe transitions from concealed dead air spaces to return air plenums. Fire sealant shall be listed and approved by CPVC-CW manufacturer for use with CPVC-CW.

1. Pipe:
   a. Schedule 40 CPVC-CW drain, waste, and vent pipe, pipe dimensions shall be Schedule 40 per ASTM F441/F441M with Type IV, Grade I components, ASTM cell classification 23448. Shall be NSF Certified and marked.
   b. Pipe shall meet UL 94 V-0 5VB rating and CAN/ULC-S102.2.
2. Fittings: Seal 40CPVC-CW drainage pattern shall meet ASTM D3311 with Type IV, Grade I components, ASTM cell classification 23447. Solvent welded one-step cement conforming to ASTM F493.
3. Entire system pipe and fittings, shall be the produce of one manufacturer, shall be manufactured in the United States, shall conform to NSF 14, and shall be installed per the manufacturer's recommendations. The system shall not be installed where working temperature exceeds 220 Deg.F.
4. Acceptable Manufacturer: ChemDrains System by Charlotte Pipe and Foundry.

C PVDF (Polyvinylidene Fluoride):
1. Shall be acceptable only if approved by the Local Authorities having Jurisdiction. PVDF may be used anywhere above and below slab, including return air plenum ceiling spaces. Fire seal all pipe penetrations in fire-rated walls and where pipe transitions from concealed dead air spaces to return air plenums, especially when using polypropylene piping in those adjacent spaces.
2. Pipe:
   a. Schedule 40 PVDF drain, waste and vent pipe, iron pipe dimensions from PVDF resin meeting ASTM D3222 with dimensional tolerances of ASTM 2447.
      1) Piping material shall meet ASTM E84 and UL 723 requirements for flame spread and smoke generation with UL listing 94-VO (non-combustible) for plenum rated conditions.
3. Fittings: Socket fusion joints with PVDF Bell and spigot with heat fusion (electrofusion) joints with using metal wire 1-1/2" through 6" fusion coils
4. Acceptable Manufacturers: Orion, GF Fuseal, or Enfield.

2.5 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
1. Manufacturers:
   a. Uponor, Inc: www.uponorengineering.com/#sle.
   b. Raupex.
   c. Watts.
2. PPI TR-4 Pressure Design Basis:
   a. 160 psig at maximum 73 degrees F.
3. Fittings: Below slab fittings are not allowed.
4. Fittings: Brass and engineered polymer (EP) ASTM F1960.
5. Joints: Below slab joints are not allowed.
6. Joints: ASTM F1960 cold-expansion fittings.

2.6 DOMESTIC WATER PIPING, ABOVE GRADE

A Copper Pipe: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.
3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

B Cross-Linked Polyethylene (PEX-a) Pipe: ASTM F876, SDR 9 manufactured using the Engel-method.
1. Tested to comply with ASTM F2023 requirements for minimum chlorine resistance.
2. Cold-expansion Fittings: ASTM F877 or ASTM F1960, lead-free brass or engineered polymer (EP) fitting utilizing cold-expansion PEX-a reinforcing rings.

a. All PEX-a piping shall be provided with PEX-a pipe supports, coordinate sizing of support with manufacturer.

3. Metal to PEX Transition Fittings:
   a. Flanges: ASME B16.5 , Class 150, with ASTM F1960 cold-expansion end.
   b. Groove Adapter: One CSA B242-05 groove end and one ASTM F1960 cold-expansion end.
4. PPI TR-4 Pressure Design Basis:
   a. 80 psig at maximum 200 degrees F.
   b. 100 psig at maximum 180 degrees F.
   c. 160 psig at maximum 73.4 degrees F.
5. Fittings: Third-party certified to NSF/ANSI 14 and ASTM F1960 cold-expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, 1/2 inch through 3 inch nominal pipe size fittings manufactured from the following material types: engineered polymer (EP), brass, and lead-free (LF) brass.
6. Joints: ASTM F1960 cold-expansion fittings.
7. Multiport Tees and Elbows: : Multiple-outlet fitting complying with ASTM F877; with ASTM F1960 inlets and outlets.
8. Transition Fittings:
   a. PEX-to-Metal Transition Fittings:
      1) Manufacturers: Provide fittings from the same manufacturer of the piping.
      2) Third-party certified to NSF/ANSI 14 and ASTM F1960 cold expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, 1/2 inch through 3 inch nominal pipe size fittings manufactured from the following material types:
      3) PEX-a to copper sweat transition: One-piece lead free (LF) brass fitting with sweat adapter and ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
      4) PEX-a to copper press transition: One-piece lead free (LF) brass fitting with one ASME B16.51 copper press end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
      5) PEX-a to flange transition: Two-piece fitting with one steel flange conforming to ASME B 16.5 and one lead free (LF) brass adapter conforming to ASTM F1960.
   b. PEX-toThermoplastic Transition Fittings:
      1) PEX-a to CPVC transition: Thermoplastic fitting with one spigot or socket end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

2.7 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A PVC Pipe: ASTM D2665 or ASTM D3034.
1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.8 STORM DRAINAGE PIPING, ABOVE GRADE

A Cast Iron Pipe: CISPI 301, hubless, service weight.
1. Fittings: Cast iron.
2. Joints: Shelded Heavy Duty No-Hub Coupling.

B PVC Pipe: ASTM D2665.
1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.9 NATURAL GAS PIPING, BURIED BEYOND 5 FEET OF BUILDING

A Flexible Gas Piping:
1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.
2. Fittings: Provided by piping system manufacturer.

B Polyethylene Pipe: ASTM D2513, SDR 11.
1. Fittings: ASTM D2683 or ASTM D2513 socket type.
2. Joints: Fusion welded.

2.10 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A Polyethylene Pipe: ASTM D2513, SDR 11.
1. Fittings: ASTM D2683 or ASTM D2513 socket type.
2. Joints: Fusion welded.

2.11 NATURAL GAS PIPING, ABOVE GRADE

A Steel Pipe: ASTM A53/A53M Schedule 40 black.
1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
2. Joints:
a. Gas pressure less than 0.5-psig: Threaded or Cold Press Mechanical Joints.
b. Gas pressure greater more than 0.5-psig and less than 5-psig: Welded to ASME B31.1 or Cold Press Mechanical Joints.

2.12 PIPE FLANGES, UNIONS, AND COUPLINGS

A Unions for Pipe Sizes 3 inch and Under:
1. Ferrous Pipe: Class 150 malleable iron threaded unions.
2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B Flanges for Pipe Sizes Over 1 inch:
1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
1. Dimensions and Testing: In accordance with AWWA C606.
2. Housing Material: Provide ASTM A47/A47M malleable iron, ductile iron, or _____, galvanized.
3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
4. When pipe is field grooved, provide coupling manufacturer's grooving tools.
5. Manufacturers:
a. Anvil International; _____: www.anvilintl.com/#sle.
b. Apollo Valves; _____: www.apollovalves.com/#sle.
c. Grinnell Products; _____: www.grinnell.com/#sle.
d. Victaulic Manufacturing Co; www.victaulic/#sle
e. Substitutions: See Section 01 60 00 - Product Requirements.

D No-Hub Couplings:
1. Testing: In accordance with ASTM C1277 and CISPI 310.
2. Gasket Material: Neoprene complying with ASTM C564.
3. Band Material: Stainless steel.
4. Eyelet Material: Stainless steel.

E Shielded, Heavy Duty No-Hub Couplings:
1. Testing: In accordance with ASTM C1540 and FM 1680.
2. Gasket Material: Neoprene complying with ASTM C564.
3. Band Material: Stainless steel.
4. Eyelet Material: Stainless steel.
5. Manufacturers:
a. ANACO-Husky
b. Clamp-All Corp

c. Ideal Clamp Products, Inc; Yellow Shield Heavy Duty: www.idealtridon.com//#sle.
d. Tyler Pipe: a subsidiary of McWane Inc.
e. MIFAB, Inc; MI-QXHUB: www.mifab.com/#sle.
f. Substitutions: See Section 01 60 00 - Product Requirements.

F No-hub Cast Iron Piping Restraints:
1. CISPI 301 large diameter no-hub cast iron fittings, 6 inch and larger in size, with supplemental support to minimize the risk of joints separation under high thrust conditions. Auxiliary restraint products used shall be manufactured assemblies with thrust pressure rating adequate for the specific installation. Field devised methods and materials are not permitted.
2. Manufacturers:
a. Holdrite No Hub Fitting Restraints.
b. Substitutions: See Section 01 60 00 - Product Requirements.

G Cold Press Mechanical Joints:
1. Manufacturers:
a. Viega MegaPress
b. Substitutions: See Section 01 60 00 - Product Requirements.
2. Mechanical joint fitting system shall conforming to material requirements of ASTM A420 or ASME B16.3 and performance criteria ANSI LC-4/CSA 6.32.
3. Piping shall be meet the requirements of ASTM A53/A53M and ASTM A106/A106M Schedule 40 carbon steel pipe.
4. Pipe and fittings shall comply with ANSI LC-4/CSA 6.32 and the latest edition of NFPA 54.

2.13 PIPE HANGERS AND SUPPORTS

A Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
3. Trapeze Hangers: Welded steel channel frames attached to structure.
4. Vertical Pipe Support: Steel riser clamp.

B Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
2. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
3. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
2. Hangers for Cold Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
3. Hangers for Hot Pipe Sizes 2 to 4 inch: Carbon steel, adjustable, clevis.

2.14 BALL VALVES

A Construction, 4 inch and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.15 BUTTERFLY VALVES

A Construction 1-1/2 inch and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.

B Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.16 BALANCING VALVES

A Construction: Class 125, brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

B Manual Operated Y-Pattern Globe, Size 1/2 to 2 inch:
1. Class 125, brass or bronze body, multi-turn handwheel, memory stop, variable orifice, soldered connections, dual PT (hot and cold pressure-temperature) test ports for 300 psi, minus 4 to 250 deg F WOG service.

C Calibration: Control flow within five percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

2.17 PRESSURE REDUCING VALVES

A 2 inch and Smaller:
1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
2. Pressure Reducing Pilot-Operator:
   a. Operating Range: 5 to 50 psi.
   b. Connected into brass or bronze pilot piping and fittings.
   c. Fixed flow restrictor, pressure gauges, and isolation valves.

B 2 inch and Larger:
1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.
2. Pressure Reducing Pilot-Operator:
   a. Operating Range: 5 to 50 psi.
   b. Connected into brass or bronze pilot piping and fittings.
   c. Fixed flow restrictor, strainer, pressure gauges, and isolation valves.

2.18 PRESSURE RELIEF VALVES

A ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

2.19 PRESSURE-TEMPERATURE VALVES

A ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME BPVC-IV certified and labelled.

2.20 STRAINERS

A Size 1/2 inch to 3 inch:
1. Class 150, threaded forged bronze Y-pattern body, stainless steel perforated mesh screen with cap, and rated for 150 psi, 250 deg F WOG service.

B Size 2 inch and Smaller:
1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

C Size 1-1/2 inch to 4 inch:
1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

PART 3 EXECUTION

3.1 PREPARATION

A Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B Remove scale and dirt, on inside and outside, before assembly.

C Prepare piping connections to equipment with flanges or unions.

3.2 EXCAVATION FOR UTILITY TRENCHES

A Excavate trenches to indicated gradients, lines, depths, and elevations.
1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line. Provide bentonite “trench plug” that extends at least 5 feet out from the face of the building’s exterior.

B Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
1. Clearance: 12 incheseach side of pipe.

C Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.3 UTILITY TRENCH BACKFILL

A Place backfill on subgrades free of mud, frost, snow, or ice but not before completing the following.
1. Testing and inspecting underground utilities.
2. Removing trash and debris.

B Trench backfill from 6” below pipe to 12” above shall be bank sand.

C Place and compact bedding course on trench bottoms. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

D Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil.

E Backfill voids with satisfactory soil while removing shoring and bracing.

F Place and compact initial backfill of bed sand or subbase material in 6 inch lifts, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

3.4 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Install cast-iron soil piping according to CISPI 301 and CISPI 310.
1. Install encasement on underground piping according to ASTM A674 or AWWA C105/A21.5.

C Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

D Provide non-conducting dielectric connections wherever jointing dissimilar metals.

E Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

F Install piping to maintain headroom, conserve space, and not interfere with use of space.

G Group piping whenever practical at common elevations.

H Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
1. See Section 22 07 19.

I Install valves with stems upright or horizontal, not inverted. See Section 22 05 23.

J Install water piping to ASME B31.9.

K Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

L PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

M Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9.
2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
3. Place hangers within 12 inches of each horizontal elbow.
4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
7. Provide copper plated hangers and supports for copper piping.

N When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

O Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line. Provide bentonite “trench plug” that extends at least 5 feet out from the face of the building’s exterior.

P Fire wrap all PVC or CPVC piping installed in return air plenums.

Q PEX Piping Installation:
1. Install domestic water piping according to approved shop drawings and coordination drawings.
2. Install PEX piping system in compliance with the maufacturer's requirements.
3. PEX shall not be installed in areas within five feet of a UV light source, such as LED and fluorescent light fixtures or other UV-generating devices.

4. White or blue PEX shall not be installed outdoors where it is exposed to direct sunlight for more than one month; red PEX shall not be installed outdoors where it is exposed to direct sunlight for more than six months.
5. Install PEX piping free of kinks.
6. Above Ground Installation:
    a. Comply with manufacturer's product data, including product technical bulletins, installation instructions and design drawings, including the following.
        1) PEX piping shall be installed per ASTM E84 requirements for plenum applications.
        2) Install PEX-a Pipe Support and provide all required hangers and supporting strapping as required by manufacturer to provide a code compliant installation.
        3) Install PEX piping in straight runs free of sags and kinks and provide bend supports at all 1/2 inch and 3/4 inch drops.
        4) All PEX piping penetrations through wall plates shall be protected or shielded as required to prevent damage to piping.
        5) PEX tubing passing through metal studs shall use grommets or sleeves at the penetration.Install PEX piping from the multiport tee or manifold to each fixture as a home run.
        6) Install PEX-a Pipe Support, fixed anchor points, and hangers in compliance with the manufacturer's requirements to minimize expansion and contraction.
        7) Install PEX piping at each fixture with out of the wall support bracket to secure piping and prevent excess movement when water stops or shut valves are operated.
        8) Install all PEX manifolds centered in access panels to permit servicing.
    b. Below-ground Installation:
        1) PEX piping penetrations through slabs shall be protected by PEX stand-up brackets or PVC bend supports to prevent damage to piping.
        2) Install PEX piping from the manifold as a home run. No joints shall be installed below the slab.
7. PEX-a Hangers and Supports:
    a. Horizontal PEX-a piping: Install supports suitable for PEX-a piping in compliance with local codes.
        1) Note: Per ICC PMG-1006, the above maximum hanger spacing requirements may be extended with the use of a continuous support channel.
    b. Horizontal PEX-a piping with PEX-a Pipe Support: Install supports for PEX-a piping with horizontal support channel in accordance with manufacturer's recommendations and the following maximum spacing:
        1) 3 inch nominal and smaller: Maximum span, 8 feet.
        2) Support 1-1/2 inch and smaller fittings within 12 inches.
        3) Install clamps and fixed points per the manufacturer’s recommendations.
    c. Vertical PEX-a piping: Install supports suitable for PEX-a piping in compliance with local codes:
        1) Support vertical in-wall piping every 5 feet.
        2) Support riser piping at the base of each floor and every 5 feet vertically.
8. PEX-a Piping schedule:
    a. Above ground domestic water piping shall be the following:
        1) 3 inch and smaller:
            (a) PEX-a piping with engineered polymer (EP) or lead-free brass ASTM F1960 cold-expansion fittings.

3.5 APPLICATION

A Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

B Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C Install globe valves for throttling, bypass, or manual flow control services.

D Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

E Provide spring-loaded check valves on discharge of water pumps.

3.6 TOLERANCES

A Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope.

3.7 FIELD TESTS AND INSPECTIONS

A Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.

B Domestic Water Systems:
1. Perform hydrostatic testing for leakage prior to system disinfection.
2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
3. General:
   a. Fill the system with water and raise static head to 10 psi above service pressure. Minimum static head of 50 to 150 psi. As an exception, certain codes allow a maximum static pressure of 80 psi.

C Gas Distribution Systems:
1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.
2. General Systems:
   a. Inject a minimum of 10 psi of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.
   b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound.
3. Welded Pipes or Systems with Service Pressures Above 14 in-wc:
   a. Inject a minimum of 60 psi of compressed air into the piping system for a duration of 30 minutes and verify with a gauge that no perceptible pressure drop is measured.
   b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound with 1 psi increments.

D Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A Prior to starting work, verify system is complete, flushed, and clean.

B Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.

D Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E Maintain disinfectant in system for 24 hours.

F If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.9 SERVICE CONNECTIONS

A Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, and sand strainer.

3.10 ACCEPTABLE PIPING SCHEDULES

A Domestic Water Piping, Above Ground:
1. Copper. All Sizes, Type K, Drawn with Solder or Press Sealed joints and fittings.

B Domestic Water Piping, Below Slab:
1. PEX: 3 inch and less.

C Sanitary Sewer Piping, Below Slab:
1. All Pipe Sizes:
   a. Schedule 40 PVC with solvent fittings.

D Sanitary Sewer Piping, Below Slab Connected to High Temperature Discharge (i.e. Commercial Dishwasher and Tilt-skillets/kittles):
1. When connecting to a high temperature discharge the first 15 feet of piping shall be Extra Heavy Weight Cast Iron with hub-and-spigot joints.

E Sanitary Sewer Piping, Above Ground:
1. All Pipe Sizes:
   a. Hubless, cast-iron soil pipe and fittings with heavy-duty hubless-piping couplings.

F Storm Sewer Piping, Above Ground
1. 4 inch and less:
   a. Hubless, cast-iron soil pipe and fittings with heavy-duty hubless-piping couplings.
   b. Schedule 40 PVC with solvent fittings
2. Greater than 4 inch:
   a. Hubless, cast-iron soil pipe and fittings with heavy-duty hubless-piping couplings and no-hub cast iron pipe fitting restraints at all changes in direction 45 degrees or greater.

G Natural Gas Piping:
1. Above Slab Piping:
   a. Less than 0.5 psig:
      1) All Pipe Sizes: Schedule 40 with threaded joints or welded joints.
   b. Greater than 0.5 psig and less than 5 psig:
      1) 1-inch and less: Schedule 40 with threaded joints or welded joints.
      2) Grater than 1-inch: Schedule 40 steel with welded joints.
2. Below Slab Piping:
   a. Less than 5.0 psig:
      1) Schedule 40 with welded joints and vented contanment conduit.
         (a) Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat underground pipe and fittings with protective coating for steel piping.
         (b) Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

H Pipe Hanger Spacing: Size pe
1. Metal Piping:
   a. Pipe Size: 1/2 inch to 1-1/4 inch:
      1) Maximum Hanger Spacing: 6.5 ft.
      2) Hanger Rod Diameter: 3/8 inches.

b. Pipe Size: 1-1/2 inch to 2 inch:
   1) Maximum Hanger Spacing: 10 ft.
   2) Hanger Rod Diameter: 3/8 inch.
c. Pipe Size: 2-1/2 inch to 3 inch:
   1) Maximum Hanger Spacing: 10 ft.
   2) Hanger Rod Diameter: 1/2 inch.
d. Pipe Size: 4 inch to 6 inch:
   1) Maximum Hanger Spacing: 10 ft.
   2) Hanger Rod Diameter: 5/8 inch.
e. Pipe Size: 8 inch to 12 inch:
   1) Maximum hanger spacing: 14 ft.
   2) Hanger Rod Diameter: 7/8 inch.
f. Pipe Size: 14 inch and Over:
   1) Maximum Hanger Spacing: 20 ft.
   2) Hanger Rod Diameter: 1 inch.

2. Plastic Piping:
   a. All Sizes:
      1) Maximum Hanger Spacing: 6 ft.
      2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION

SECTION 22 10 06 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2022.

B ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2021.

C ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.

D NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

E NSF 372 - Drinking Water System Components - Lead Content; 2022.

F PDI-WH 201 - Water Hammer Arresters; 2017.

1.2 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.2 DRAINS

A Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
2. Josam Company: www.josam.com/#sle.
3. MIFAB, Inc: www.mifab.com/#sle.
4. Zurn Industries, LLC: www.zurn.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B Roof Drains:
1. Assembly: ASME A112.6.4.
2. Body: Lacquered cast iron with sump.
3. Strainer: Removable polyethylene dome with vandal proof screws.
4. Accessories: Coordinate with roofing type, see Section _____:
   a. Membrane flange and membrane clamp with integral gravel stop.
   b. Adjustable under deck clamp.
   c. Roof sump receiver.
   d. Waterproofing flange.
   e. Adjustable extension sleeve for roof insulation.
   f. O-ring seal between male and female connection pipes.
5. Manufacturers:
   a. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.

b. Josam Company: www.josam.com/#sle.
c. MIFAB, Inc: www.mifab.com/#sle.
d. Zurn Industries, LLC: www.zurn.com/#sle.

C Floor Drains:
1. Manufacturers:
a. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
b. Josam Company: www.josam.com/#sle.
c. MIFAB, Inc: www.mifab.com/#sle.
d. Zurn Industries, LLC: www.zurn.com/#sle.

2.3 CLEANOUTS

A Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
2. Josam Company: www.josam.com/#sle.
3. MIFAB, Inc: www.mifab.com/#sle.
4. Zurn Industries, LLC: www.zurn.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 HOSE BIBBS

A Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
2. MIFAB, Inc: www.mifab.com/#sle.
3. Watts Regulator Company: www.wattsregulator.com/#sle.
4. Zurn Industries, LLC: www.zurn.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.5 HYDRANTS

A Manufacturers:
1. Jay R. Smith Manufacturing Company; _____: www.jrsmith.com/#sle.
2. MIFAB, Inc: www.mifab.com/#sle.
3. Zurn Industries, LLC; _____: www.zurn.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.6 WASHING MACHINE OUTLET BOXES

A Box Manufacturers:
1. IPS Corporation/Water-Tite: www.ipscorp.com/#sle.
2. Oatey Supply Chain Services, Inc: www.oatey.com/#sle.

B Description: Plastic preformed rough-in box with brass valves with single lever handle, socket for 2 inch waste, slip in finishing cover.

2.7 ICE MAKER OUTLET BOXES

A Box Manufacturers:
1. IPS Corporation/Water-Tite: www.ipscorp.com/#sle.
2. Oatey Supply Chain Services, Inc: www.oatey.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B Description: Plastic preformed square or round rough-in box with brass quarter-turn ball valve, and slip-in finishing cover.

2.8 BACKFLOW PREVENTERS

A Manufacturers:
1. Apollo Valves: www.apollovalves.com/#sle.
2. Cash Acme, a brand of Reliance Worldwide Corporation: www.cashacme.com/#sle.
3. MIFAB, Inc: www.mifab.com/#sle.
4. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com/#sle.
5. Zurn Industries, LLC: www.zurn.com/#sle.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B Reduced Pressure Backflow Preventer Assembly:
1. ASSE 1013 and NSF 61 compliant reinforced-nylon body and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, integral male test fittings, and non-threaded vent outlet.
2. Size: 3/4 to 2 inch assembly with threaded full port ball valves.
3. Maximum Working Parameters: 175 psi at 180 degrees F.
4. Accessories: Provide air gap fitting, lead-free Y-strainer, and test cocks.

C Reduced Pressure Backflow Preventer Assembly:
1. ASSE 1013 and NSF 61 compliant stainless steel body assembly with corrosion resistant internal parts, stainless steel springs, diaphragm type differential pressure relief valve located between check valves, third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.
2. Configured to protect against backsiphonage and backpressure into potable water supply.
3. Size: 2-1/2 to 10 inch assembly with flanged OS&Y gate valves.
4. Accessories: Provide flanged Y-strainer and test cock.

2.9 DOUBLE CHECK-VALVE ASSEMBLIES

A Manufacturers:
1. Apollo Valves: www.apollovalves.com/#sle.
2. MIFAB, Inc: www.mifab.com/#sle.
3. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com/#sle.
4. Zurn Industries, LLC: www.zurn.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B Double Check Valve Assembly:
1. ASSE 1012; cast bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.
2. Size: 3/4 to 2 inch, NPS assembly with threaded full port ball valves.
3. Accessories: Provide lead-free Y-strainer.

2.10 WATER HAMMER ARRESTORS

A Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
2. Precision Plumbing Products: www.pppinc.net/#sle
3. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com/#sle.
4. Zurn Industries, LLC: www.zurn.com/#sle.

B Water Hammer Arrestors:
1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

2.11 FLOOR DRAIN TRAP SEALS

A Description: Push-fit EPDM or silicone fitting with a one-way membrane.

2.12 ELECTRONIC TRAP-SEAL PRIMERS

A Description: Enclosed electronic trap seal primer system with timer.

2.13 THERMOSTATIC BALANCE VALVE

A Manufacturers:
1. ThermOmega Tech
2. Substitutions: See Section 01 60 00 - Product Requirements.

B Thermostatic Balance Valve:
1. The valve shall be certified lead free according to NSF/ANSI 61 standards.
2. The valve body shall be constructed out of stainless steel.
3. The valve shall be rated for 200 PSIG working pressure and 250°F max. temperature.
4. The valve shall have a fixed, non-adjustable (tamper proof) temperature setpoint; temperature setpoints range from 80°F to 170°F in 5°F increments.
5. The valve shall have a temperature accuracy of ±3.0°F (±1.7°C).
6. The valve shall have a wax thermostatic element.
7. The valve shall come in 6 sizes: 1/2”; 3/4”; 1”; 1 1/4”; 1 1/2”; 2”.

C Required Accessories:
1. Integrated check valve.
2. Shut off valves at inlet and outlet, match valve connections with piping type, i.e. PEX ends, Union or ProPress.

PART 3 EXECUTION

3.1 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Pipe relief from backflow preventer to nearest drain.

END OF SECTION

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2014.

B ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

C ASME A112.18.2 - Plumbing Waste Fittings; 2020.

D ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2018.

E ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018, with Errata.

F ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.

G ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

H ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

I NSF 2 - Food Equipment; 2021.

J NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

1.2 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittals procedures.

B Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

1.3 QUALITY ASSURANCE

A Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" for plumbing fixtures for people with disabilities.

C Regulatory Requirements: Comply with requirements of EPA (EPACT) related to about water flow and consumption rates for plumbing fixtures.

D NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

F Comply with the following applicable standards and other requirements specified for plumbing fixtures:
1. Enameled, Cast-Iron Fixtures: ASME A112.19.1
2. Stainless-Steel Commercial, Handwash Sinks: NSF 2.
3. Vitreous-China Fixtures: ASME A112.19.2
4. Shower Trim: ASME A112.18.2
5. Water-Closet, Flushometer: ASME A112.18.1 or ASME A112.19.5.
6. Emergency Showers: ANSI Z358.1.
7. Emergency Thermostatic Mixing Valves: ASSE 1070.

PART 2 PRODUCTS

2.1 PLUMBING FIXTURES AND TRIM

A Refer to fixture schedule on drawings for additional fixture and trim requirements.

B Available Manufacturers:

1. Vitreous China:
   a. American Standard.
   b. Koehler.
   c. Zurn.
   d. Toto.
   e. Substitutions: See Section 01 60 00 - Product Requirements.
2. Stainless Steel Sinks:
   a. Elkay.
   b. Just Manufacturing.
   c. Substitutions: See Section 01 60 00 - Product Requirements.
3. Faucets:
   a. Chicago Faucets.
   b. Kohler Company.
   c. T&S Brass.
   d. Toto Corporation.
   e. Zurn Industries.
   f. Substitutions: See Section 01 60 00 - Product Requirements.
4. Flush Valves:
   a. Sloan.
   b. Zurn.
   c. Toto.
   d. Substitutions: See Section 01 60 00 - Product Requirements.
5. Toilet Seats:
   a. American Standard.
   b. Bernis Manufacturing.
   c. Church Seat Company.
   d. Olsonite.
   e. Substitutions: See Section 01 60 00 - Product Requirements.
6. Angle Stops and P-traps:
   a. McGuire.
   b. Zurn.
   c. Substitutions: See Section 01 60 00 - Product Requirements.
7. Protective Shield Guards:
   a. Engineered Brass Co.
   b. McGuire Manufacturing Co., Inc.
   c. TRUEBRO, Inc.
   d. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.
   e. Substitutions: See Section 01 60 00 - Product Requirements.
8. Drinking Fountains:
   a. Elkay.
   b. Halsey Taylor.
   c. Haws.
   d. Substitutions: See Section 01 60 00 - Product Requirements.
9. Wash Fountains:
   a. Acorn Engineering Company.
   b. Bradley Corporation.
   c. Substitutions: See Section 01 60 00 - Product Requirements.
10. Shower Valves:

a. Bradley.
b. Leonard
c. Symmons.
d. Watts.
e. Substitutions: See Section 01 60 00 - Product Requirements.

11. Emergency Eye Wash and Drench Showers:
a. Therm-Omega-Tech, Inc..
b. Speakman.
c. Guardian.
d. Haws.
e. Substitutions: See Section 01 60 00 - Product Requirements.

12. Mop Sinks:
a. Acorn Engineering Company.
b. Kohler.
c. Zurn.
d. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E Install wall-mounting fixtures with tubular waste piping attached to supports.

F Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G Install counter-mounting fixtures in and attached to casework.

H Install fixtures level and plumb according to roughing-in drawings.

I Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

J Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

N Install toilet seats on water closets.

O Install trap-seal liquid in dry urinals.

P Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

Q Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

R Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

S Install shower flow-control fittings with specified maximum flow rates in shower arms.

T Install traps on fixture outlets.
1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

U Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."

V Set service basins in leveling bed of cement grout. Grout is specified in Division 22 Section "Common Work Results for Plumbing."

W Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.3 CONNECTIONS

A Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.4 FIELD QUALITY CONTROL

A Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B Replace washers and seals of leaking and dripping faucets and stops.

C Install fresh batteries in sensor-operated mechanisms.

3.6 CLEANING

A Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A Provide protective covering for installed fixtures and fittings.

B Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 01 00 - MECHANICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 APPLICABILITY

A This section applies to and forms a part of each of the sections of Division 23. This section, and each of the sections to which it applies, is subject to the requirements of the Instructions to Bidders, General Conditions, and Special Conditions of these complete specifications.

B The work covered by this Division of the Specifications consists of furnishing all labor, supervision, equipment, materials, all incidentals, related items, and appurtenances, and performing all operations necessary to complete the installation of work in strict accordance with these specifications and drawings.

C All work shall be finished, tested and ready for operation.

1.2 DEFINITIONS

A Words "Material" or "Furnish" where written in Division 23 specifications and drawings shall mean any and all apparatus, equipment, devices, fixtures, components, products, assemblies, items, parts, things, and any other pieces specified or shown or required.

B Words "Labor" or "Install" where written in Division 23 specifications and drawings shall mean any and all physical effort, manpower, time, expertise, tools, equipment and services to carefully assemble, install and affix all material in a proper, complete and acceptable manner.

C Word "Provide" where written in Division 23 specifications and drawings shall mean "Mechanical Contractor shall furnish all labor and material and completely and properly install such material and leave same in acceptable condition and intended acceptable working order".

1.3 DISCREPANCIES OR OMISSIONS FROM DRAWINGS OR DOCUMENTS

A Notify the Engineer of any discrepancies in, or omissions from the drawings or documents. Neither the Owner nor the Architect will be responsible for any oral instructions or modifications of the specifications or drawings. Written interpretations will be made only by Addenda.

B If discrepancies are not reported, the contractor shall bid the greater quantity or better quality (highest dollar value), and appropriate adjustment will be made after contract award.

C Discrepancies discovered during construction shall immediately be called to the attention of the Architect/Engineer for clarification.

D All minor items necessary for the completion and successful operation of the system, whether or not herein definitely specified or indicated on the drawings, shall be furnished and installed.

E Omission of/or express reference to any material necessary for/or reasonably incidental to complete installation shall not release Contractor from providing such material. Where material is shown on drawings but is not specified or is specified but not shown, such material shall be considered both shown and specified.

F Any work not clear to Contractor shall be referred to Engineer for clarification before bid is submitted. If no question is raised prior to opening of bid, Contractor shall be required to provide work in question as directed by Engineer, whose decision is final, without additional charges.

G By virtue of submitting a bid, Contractor agrees that they are skilled and experienced in use of and in interpretation of drawings and specifications. Contractor further agrees that they have carefully reviewed all drawings, all specifications, and all addenda, which constitute bid documents for this contract, and finds them free of ambiguities and good and sufficient for bidding and construction purposes.

1.4 DRAWINGS

A The drawings indicate the extent and general layout of the mechanical systems intended for the building. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, connections, and accessories which may be required. Furnish offsets, fittings, valves, and accessories as may be required, to produce a complete and operating installation of type shown and specified.

B All piping and ductwork shall be routed so as not to obstruct access to other equipment (i.e. VAV box controls, electrical devices, fire alarm devices, etc.). Routing indicated on drawings is representative of intended location but shall be field verified. It shall be this contractor’s responsibility to coordinate with other trades for accessibility.

C Any work or system on the roof not explicitly indicated on the roof plan shall be approved by the engineer prior to installing.

D In general, the mechanical equipment drawings are drawn to scale as noted. Obtain dimensions and locations of partitions, walls, etc., from the Architectural drawings wherever possible and do not scale the mechanical drawings. Consult the Architectural drawings for details of construction, location of suspended ceilings, ceiling heights, and other pertinent information. Architect's drawings shall not take precedence over field measurements.

E All drawings and specifications shall be considered in bidding. The drawings and specifications are complimentary, and what is called for in either of these shall be as binding as though called for by both. Should any conflict arise between drawings and specifications, such conflict shall be brought to the attention of the Architect.

1.5 EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

A When any Contractor submits approval of materials and/or equipment of different physical size, weight, capacity, electrical characteristics, function, color, access, it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc.

B In all cases where substitutions or deviations affect other trades, the Contractor requesting or submitting such substitutions shall advise all such Contractors of the change and shall compensate them for all necessary changes in their work. In the event that a substitution or deviation is approved, it is the submitting contractor's responsibility to coordinate any changes with the effected contractors. Any drawings, specifications, diagram, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense.

1.6 PRIOR APPROVAL REQUEST

A Requests for substitution of materials and/or equipment other than those named in the specifications may be made to the Architect/Engineer. The request shall include complete information, test, etc. relating to quality, performance, and suitability. All requests shall be in the Architects/Engineers office not later than ten (10) days prior to the Bidding date. All approved requests shall be included in the project addenda.

1.7 INSTRUCTION OF OWNER’S EMPLOYEES

A Furnish, without additional expense to the Owner, the services of competent instructors, who will give full instructions in the care, adjustment, and operation of all parts of the mechanical equipment to the Owner's employees who are to have charge of the equipment.

B An operating and maintenance manual shall be made available to the Owner's operating personnel during the instruction and left with the Owner upon completion of the instruction.

C The number of man hours of instruction furnished for each system shall be as specified below. Hours of instruction shall be divided up into a minimum of two (2) instruction periods with 75% of time used for an initial instruction and 25% of time used for a follow up instruction, a minimum of four (4) weeks after initial instruction.

D Instruction of Owner's Employees" form at end of this section shall be filled out and signed by Contractor and Owner's Representative and three (3) signed copies of form sent to Engineer.

E Owner training and instructions:
1. Ventilation systems including but not limited to packaged rooftop units shall not be less than four (4) man hours.
2. Automatic temperature control systems including all components of the system shall be not less than eight (8) man hours.

1.8 INSTALLATION OF EQUIPMENT

A All appliances and equipment shall be installed and connected in accordance with manufacturer's instructions and recommendations unless such instructions are in conflict with these specifications. Auxiliary piping, valves, electrical connections, etc., recommended by the manufacturer or required for proper operation shall be furnished and installed complete.

B All equipment shall be installed in such a manner and location as to facilitate accessibility for maintenance and/or replacement.

C As a part of the work of this contract, the Mechanical Contractor shall make any changes in the pulleys, belts, and dampers, and shall install additional dampers required for correct balance as recommended by air balance agency, at no additional cost to the Owner.

1.9 TEMPORARY USE OF EQUIPMENT

A The use of permanent HVAC systems for temporary heating, cooling, ventilating, and conditioning is strictly prohibited without written authorization from the Engineer.

B Permission to use the permanent equipment does not relieve the Contractors from the responsibility for any damages to the building construction and/or equipment which might result because of its use.

C At substantial completion of the project the entire unit shall be cleaned to present a like “new” unit for the Owner and all filters shall be replaced with new.

1.10 RECORD DRAWING

A The contractor shall maintain one set of drawings at the job site used as a master copy. Each change order or other revision, deletion, or addition shall be clearly marked and noted by colored pencil. This copy of plans shall be furnished to the Architect upon completion of the project.

B The contractor shall note on the record drawings the elevations and/or inverts of all mechanical services (i.e., sewer, water, etc.) where they exit the building foundation. The contractor shall also record dimensions from the building to points on all mechanical equipment installed (ie., fuel tanks, oil piping, etc.).

C A complete set of these drawings shall be scanned at a resolution of 600dpi in color and saved in an Adobe PDF portfolio format with index to each sheet by name and burned to a non-volatile media. The electronic copy of the as-built drawings shall be transmitted to the Architect. After review and approval by the Architect, the as-built drawings will be turned over to the Owner.

1.11 COOPERATION WITH OTHER TRADES

A Cooperate with other trades so as to avoid interferences. Where required to avoid interferences with other work or to increase the headroom, the Contractor shall off-set the piping and/or re-route the duct work where directed by the Engineer. Carefully check all construction details to assure the proper installation of all work under this specification. Schedule the work such that it will keep pace with the work of other crafts and cause no delay.

B The Contractor shall furnish to other trades, as required, all necessary electrical characteristics, templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.12 EQUIPMENT SUPPORT

A Each piece of equipment, apparatus, piping, or conduit suspended from the ceiling or mounted above the floor level shall be provided with suitable structural support, pipe stand, platform or carrier in accordance with the best recognized practice. Such supporting or mounting means shall be provided by the Contractor for all equipment and piping. Exercise extreme care that structural members of building are not overloaded by such equipment. Provide any required additional bracing, cross members, angles, support, etc.

1.13 DUCT AND PIPE MOUNTING HEIGHTS

A All exposed or concealed ductwork, piping, etc., shall be held as high as possible unless otherwise noted and coordinated with all other trades. Exposed piping and ductwork shall, insofar as possible, routed perpendicular or parallel to the building structure.

1.14 PREFABRICATED SYSTEMS

A It is the contractor's responsibility to verify fit and function of any contractor prefabricated system prior to fabrication and delivery of system to project site for installation including above and below grade system. If any unforeseen conditions are encountered after the system has been prefabricated rendering system unusable, the contactor will not be compensated for materials and labor of the prefabricated system.

1.15 INSPECTION OF SITE

A Before submitting a proposal on the work contemplated in these specifications and accompanying drawings, each bidder shall examine the site and familiarize themself with all of the existing conditions and limitations. No extras will be allowed because of Contractor's misunderstanding as to the amount of work involved or lack of his knowledge of any condition in connection with the new construction.

1.16 PAVEMENT, CURB AND SIDEWALK REPLACEMENT

A This Contractor shall be responsible for replacement of existing street pavement, curbs, and sidewalks, etc., removed or damaged by them during the course of the work, unless such pavement, curbs, sidewalks are to be constructed under the General Contract. The work shall be done in accordance with local requirements.

1.17 SALVAGE

A All items removed from existing building shall be salvaged in a workmanlike manner.

B The handling, storage, and disposition of salvage materials shall be as directed by the Architect. Generally, all salvage material shall remain the property of the Owner. Materials and equipment not wanted by Owner shall be removed from the job site and become the property of the contractor.

1.18 CODES, ORDINANCES, REGULATIONS & STANDARDS

A The entire installation shall be made in accordance with all state and local laws. If, in any instance, the plans and specifications conflict with such laws, the law shall take precedence. This, however, shall not be construed as relieving the contractor from complying with any requirements of the drawings and specifications that may be in excess of the rules and not contrary to the same.

B All work shall conform to applicable state and local codes, ordinances, regulations and/or standards.

1.19 PERMITS AND LICENSES

A This contractor shall obtain and pay for all licenses and permits and shall pay for all fees and charges for the connection to outside services and use of property other than the site of the work for storage of materials or other purposes.

B Contractor shall coordinate and request all inspections from authority having jurisdiction. The Contractor shall notify the Architect of all such coordinated inspections (date & time) and shall submit certificates of inspection and final approval of the local inspection authority.

1.20 TEST

A Test all equipment installed under these specifications and demonstrate its proper operation to the Engineer.

B Do not test or operate equipment for any purpose, until it has been fully lubricated in accordance with the manufacturer's instructions and, if it is a centrifugal pump, until it has been connected to the piping system with sufficient water so that it will not run dry.

C Submit to the Engineer air balance and water balance reports indicating test results as hereinafter specified under Section 230593 "TESTING, ADJUSTING AND BALANCING FOR HVAC".

D All testing shall be completed before final inspection, and test results shall be available during the final inspection.

1.21 GUARANTEES

A This contractor shall guarantee all equipment, material, and workmanship for a period of one year from date of final certificate. Any defects in mechanical equipment, workmanship or materials that appear, or cause trouble of any kind within a period of one year from date of final certificate shall be remedied, free of charge. Refer to other sections of these specifications for guarantees in excess of the requirements herein described.

1.22 CONSTRUCTION CLOSEOUT DOCUMENTS

A This Contractor and their subcontractors should proceed immediately to fully complete the work as listed at the end of this Section. The Contractor responsible shall initial and date the "Contractor Completed" column after each item as it is complete and forward a copy of the fully completed punch list to the Engineers for their final approval before final punch list inspection. Reply with an NA where items don’t pertain.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

END OF SECTION

SECTION 23 01 20 - MECHANICAL SHOP DRAWINGS AND SUBMITTALS

PART 1 GENERAL

1.1 SHOP DRAWINGS

A Contractor shall submit for acceptance to the Architect shop drawings specified for the equipment indicated in these specifications. The shop drawings shall include the following minimum information:
1. The equipment manufacturer’s name and address.
2. Catalog designation or model number.
3. Rough-in data & dimensions.
4. Performance curves and rated capacities & operational characteristics.
5. Equipment specific wiring diagrams.
6. Electrical characteristics.
7. Warranty information.

B All submittals shall be electronic in PDF format, hard copies will not be accepted.

C The Contractor shall thoroughly review each item for compliance with these Specifications making any necessary corrections prior to submittal. Each shop drawing set shall be stamped, signed, and dated indicating Contractor review.
1. If the Contractor fails to properly review shop drawings, the Contractor shall reimburse the Engineer for all additional reviews on a time and material basis.

D Specification Compliance Certification: Where this Section and other Sections of this Division require Specification Compliance Certification to be submitted, comply with the following:
1. Prepare a line-by-line Specification Compliance Certification by marking up a copy of the Contract Document specification section in the left margin. Accompany the markup with a written report explaining all items that are not marked with “Compliance”. Submit line-by-line markup, written report of deviations and alternates and a cover letter certified by Manufacturer or Installer that prepared the Specification Compliance Certification. Use the following key for preparing the line-by-line markup.
    a. “C” for Compliance: By noting the term "compliance" or "C" in the margin, it shall be understood that the manufacturer is in full compliance with the item specified and will provide exactly the same with no deviations.
    b. “D” for Deviation: By noting the term "deviation" or "D" in the margin, it shall be understood that the manufacturer prefers to provide a different component in lieu of that specified.
    c. “A” for Alternate: By noting the term "alternate" or "A" in the margin, it shall be understood that the manufacturer proposes to provide the same operating function but prefers to do it in a different manner.
    d. “N/A” for Not Applicable: By noting the term “not applicable” or “N/A” in the margin, it shall be understood that the specified item is not applicable to the project.

E Provide samples of materials or equipment proposed to be furnished, if requested. Samples shall become the property of the Architect/Engineer and will be returned only when accompanied by a written request to do so.

F None of the items listed shall be purchased, delivered to the site, or installed, until the item is reviewed. No substitution will be permitted after review except where such substitution is considered by the Architect to be in the best interest of the Owner.

G The Engineer will review all Shop Drawings submitted.

H Approval Stamp: This review is to verify general conformance with the design concept of the Project and substantial compliance with the information provided in the Contract Documents. This review does not in any way relieve the Contractor or their suppliers of their responsibility to provide all materials and equipment as specified, in quantities, quality and dimensions required. Submittals will be reviewed with the following actions:

1. “Reviewed” indicates that the Submittal appears to conform to the design concept of the Work and that the Contractor, at their discretion, may proceed with fabrication and/or procurement and installation. Shop drawings that are returned "Reviewed" or "Furnished as Corrected" shall not be resubmitted back to the engineer and if submitted will not be reviewed.
2. “Furnished as Corrected” indicates that the Submittal, after noted corrections are made, appears to conform to the design concept of the Work and that the Contractor, at their discretion, may proceed with fabrication and/or procurement and installation, if the corrections are accepted by the Contractor without any increase in Contract Sum or Time. If the corrections are accepted by the contractor, shop drawings that are returned "Furnished as Corrected" shall not be resubmitted back to the engineer and if submitted will not be reviewed.
3. “Revised and Resubmit” indicates that the noted revisions are such that a corrected copy of the Submittal is required for review to confirm that the noted revisions have been understood and made. The Contractor, at their discretion, may proceed with fabrication and/or procurement and installation after submitting a corrected copy and verifying with the reviewer that the corrected copy is acceptable, if the corrections are accepted by the Contractor without an increase in the Contract Sum or Time.
4. “Rejected” indicates that the Submittal does not appear to conform to the specifications, a resubmission is required, and fabrication or procurement is not authorized.

I If the Engineer rejects (Revised and Resubmit or Rejected) the same section two times the engineer shall be compensated for additional reviews. Contractor is responsible for all delays caused by the resubmittal process.

J Should the contractor fail to comply with any of the requirements of the preceding sub-paragraphs; then the right is reserved by the Architect to select any or all items in the material schedule, with that selection to be final and binding upon the contractor. The materials selected or reviewed, as the case may be, by the Architect, shall be used in the work at no additional cost to the Owner.

K When any Contractor submits approval of materials and/or equipment of different physical size, weight, capacity, electrical characteristics, function, color, access, it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc.

L In all cases where substitutions or deviations affect other trades, the Contractor requesting or submitting such substitutions shall advise all such Contractors of the change and shall compensate them for all necessary changes in their work. In the event that a substitution or deviation is approved, it is the submitting contractors responsibility to coordinate any changes with the effected subcontractors. Any drawings, specifications, diagram, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense.

1.2 EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

A When any Contractor submits approval of materials and/or equipment of different physical size, weight, capacity, electrical characteristics, function, color, access, it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc.

B In all cases where substitutions or deviations affect other trades, the Contractor requesting or submitting such substitutions shall advise all such Contractors of the change and shall compensate them for all necessary changes in their work. In the event that a substitution or deviation is approved, it is the submitting contractors responsibility to coordinate any changes with the effected subcontractors. Any drawings, specifications, diagram, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense.

1.3 SPECIAL WRENCHES, TOOLS AND KEYS

A Each Contractor shall provide, along with the equipment provided, any special wrenches or tools necessary to dismantle or service equipment or appliances installed by him. Wrenches shall include necessary keys, handles and operators for valves, switches, breakers, etc. and keys to electrical panels, alarm pull boxes and panels, etc. At least two of any such special wrench, keys, etc. shall be turned over to the Architect prior to completion of the project. Obtain a receipt that this has been accomplished and forward a copy to the Engineer.

1.4 MANUALS

A In addition to catalog data and shop drawings submitted for review, this contractor shall furnish Systems Manuals (O&M's):

1. The Contractor Shall provide an electronic copy in PDF format. The PDF shall contain:
   a. Approved Shop Drawings of all major components.
   b. Parts lists for the same components.
   c. Manufacturer's operating, maintenance, and cleaning instructions.
   d. List of materials recommended for maintenance.
   e. Factory startup reports.
   f. Valve tag list.
   g. Name and address of authorized service organization and parts depot.
   h. Chemical Treatment Analysis Reports for heating & cooling systems.
   i. Radiographic Testing Reports of welded pipe with picture of weld & location plan showing physical location of where test was performed.
   j. A description of how the components of a given HVAC system interact within the large system. For example, circulating pumps, boilers, unit heaters are part of the "heating system".
   k. A description of normal operating conditions for the system and its components.
   l. A description of common symptoms of a malfunctioning system and likely causes.
   m. Warranty letter from the automatic temperature controls contractor indicating the warranty period for their portion of the work.
   n. Signed owner instruction forms for all items specified as requiring owners' instruction.
2. The Systems manual shall have an electronic index and be broken up by individual systems such as "heating", "shop exhaust", "kitchen ventilation and exhaust", "chilled water", "administration ventilation".
3. Include at the front of the manual a complete listing of the Architect, Engineer and contractors and sub-contractors used on the project. Listing shall include names, addresses and phone numbers for each.
4. All major pieces of equipment shall be referenced with the equipment supplier's name, address and phone number shall be provided.
5. Where indicated in the Specifications, the Contractor shall provide the services of a factory trained representative to instruct the Owner's authorized personnel in the operation, control, and maintenance of equipment.

B Operations and Maintenance Manuals shall be submitted to the Engineer for approval prior to delivery to the Architect.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 23 01 30.51 - HVAC AIR-DISTRIBUTION SYSTEM CLEANING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A Cleaning of HVAC duct system, equipment, and related components.

1.02 DEFINITIONS
- A HVAC System: For purposes of this section, the surfaces to be cleaned include all interior surfaces of the heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system, including the inside of air distribution equipment, coils, and condensate drain pans; see NADCA ACR for more details.
  1. Above-ceiling plenum for supply air is required to be cleaned.
  2. Above-ceiling plenum for return air is required to be cleaned.

1.03 REFERENCE STANDARDS
- A ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- B NADCA ACR - The NADCA Standard for Assessment, Cleaning, and Restoration of HVAC System; 2021.
- C UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.
- D UL 181A - Closure Systems for Use with Rigid Air Ducts; Current Edition, Including All Revisions.

1.04 SUBMITTALS
- A See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B Product Data: Manufacturer's data sheets on each product to be used.
- C Qualifications Statement: Submit qualifications of proposed cleaning contractor for approval.
- D Material Safety Data Sheets (MSDS): For all chemical products proposed to be used in the cleaning process; submit directly to Owner.
- E Project Closeout Report: Include field quality control reports, evidence of satisfactory cleaning, and documentation of items needing further repair.

1.05 QUALITY ASSURANCE
- A Information Available to Contractor: No existing system documentation is available.
- B Cleaning Contractor Qualifications: Company specializing in the cleaning and restoration of HVAC systems as specified in this section.
  1. Certified by one of the following:
     a. NADCA, National Air Duct Cleaners Association: www.nadca.com.
  2. Having minimum of three years documented experience.
  3. Employing for this project a supervisor certified as an Air Systems Cleaning Specialist by NADCA.

PART 2 PRODUCTS

2.01 TOOLS AND EQUIPMENT
- A Vacuum Devices and Other Tools: Exceptionally clean, in good working order, and sealed when brought into the facility.
- B Vacuum Devices That Exhaust Air Inside Building, Including Hand-Held and Wet Vacuums: Equipped with HEPA filtration with 99.97 percent collection efficiency for minimum 0.3-micron size particles and DOP test number.
- C Vacuum Devices That Exhaust Air Outside Building, Including Truck- and Trailer-Mounted Types: Equipped with particulate collection including adequate filtration to contain debris removed from the HVAC system; exhausted in manner that prevents contaminant re-entry to building; compliant with applicable regulations as to outdoor environmental contamination.

2.02 REPLACEMENT PRODUCTS
- A Fibrous Glass Insulation: Provide material complying with UL 181 equivalent to existing material in quality and thickness.

2.03 SURFACE TREATMENTS
- A Anti-Microbial Materials: EPA registered specifically for use on non-porous HVAC system surfaces and applied per manufacturer's instructions.
- B Surface Coating for Fibrous Glass Materials: Water-based, zero VOC; flame spread index less that 25, smoke developed index less than 450, Class A, when tested in accordance with ASTM E84.

PART 3 EXECUTION

3.01 PROJECT CONDITIONS

A Comply with applicable federal, state, and local requirements.

B Perform cleaning, inspection, and remediation in accordance with the recommendations of NADCA "Assessment, Cleaning and Restoration of HVAC Systems" (ACR) and as specified herein.

C Where NADCA ACR uses the terms "recommended", "highly recommended", or "ideally" in regard to a certain procedure or activity, do that unless it is clearly inapplicable to the project.

D Obtain Owner's approval of proposed temporary locations for large equipment.

E Designate a decontamination area and obtain Owner's approval.

F If unforeseen mold or other biological contamination is encountered, notify Architect immediately, identifying areas affected and extent and type of contamination.

3.02 PREPARATION

A When cleaning work might adversely affect life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with authorities having jurisdiction.

B Ensure that electrical components that might be adversely affected by cleaning are de-energized, locked out, and protected prior to beginning work.

C Air-Volume Control Devices: Mark the original position of dampers and other air-directional mechanical devices inside the HVAC system prior to starting cleaning.

D Access to Concealed Spaces: Use existing service openings and make additional service openings as required to accomplish cleaning and inspection.

1. Do not cut openings in non-HVAC components without obtaining the prior approval of Owner.
2. Make new openings in HVAC components in accordance with NADCA Standard 05; do not compromise the structural integrity of the system.
3. Do not cut service openings into flexible duct; disconnect at ends for cleaning and inspection.

E Ceiling Tile: Lay-in ceiling tile may be removed to gain access to HVAC systems during the cleaning process; protect tile from damage and reinstall upon completion; replace damaged tile.

3.03 CLEANING

A Use any cleaning method recommended by NADCA ACR unless otherwise specified; do not use methods prohibited by NADCA ACR, or that will damage HVAC components or other work, or that will significantly alter the integrity of the system.

B Obtain Owner's approval before using wet cleaning methods; ensure that drainage is adequate before beginning.

C Ducts: Mechanically clean all portions of ducts.

D Hoses, Cables, and Extension Rods: Clean using suitable sanitary damp wipes at the time they are being removed or withdrawn from their normal position.

E Registers, Diffusers, and Grilles: When removing, take care to prevent containment exposure due to accumulated debris.

F Coils: Follow NADCA ACR completely including measuring static pressure drop before and after cleaning; do not remove refrigeration coils from system to clean; report coils that are permanently impacted.

G Fibrous Glass Material: Use HEPA vacuuming equipment, under constant negative pressure, do not permit to get wet, and do not damage surfaces; replace material damaged by cleaning operations.

H Existing Damaged Fibrous Glass Material: Report to Architect all evidence of damage, deterioration, delaminating, friable material, mold or fungus growth, or moisture that cannot be remedied by cleaning or resurfacing with an acceptable insulation repair coating.

1. Remove unremediable material and clean underlying surfaces.
2. Where surface damage can be repaired by applying a coating, do so at no extra cost to Owner.
3. Replace unremediable material.

I Collect debris removed during cleaning; ensure that debris is not dispersed outside the HVAC system during the cleaning process.

J Store contaminated tools and equipment in polyethylene bags until cleaned in the designated decontamination area.

3.04 REPAIR

A Repair openings cut in the ventilation system so that they do not significantly alter the airflow or adversely impact the facility's indoor air quality.

B At insulated ducts and components, accomplish repairs in such a manner as to achieve the equivalent thermal value.

C Reseal new openings in accordance with NADCA Standard 05.
D Reseal rigid fiber glass duct systems using closure techniques that comply with UL 181 or UL 181A.
E When new openings are intended to be capable of being re-opened in the future, clearly mark them and report their locations to Owner in project report documents.

3.05 FIELD QUALITY CONTROL

A Ensure that the following field quality control activities are completed prior to application of any treatments or coatings and prior to returning HVAC system to normal operation.
B Visually inspect all portions of the cleaned components; if not visibly clean as defined in NADCA ACR, re-clean and reinspect.
C Coils: Cleaning must restore the coil pressure drop to within 10 percent of the coil's original installed pressure drop; if original pressure drop is not known, coil will be considered clean if free of foreign matter and chemical residue based on visual inspection.
D Notify Architect when cleaned components are ready for inspection.
E When directed, re-clean components until they pass.
F Submit evidence that all portions of the system required to be cleaned have been cleaned satisfactorily.

3.06 ANTI-MICROBIAL TREATMENT

A When directed, apply anti-microbial treatment to internal surfaces.
B Apply anti-microbial agent after removal of surface deposits and debris.
C Apply anti-microbial treatments and coatings in strict accordance with the manufacturer's written recommendations and EPA registration listing.
D Spray coatings directly onto interior ductwork surfaces; do not "fog" into air stream.

3.07 ADJUSTING

A After satisfactory completion of field quality control activities, restore adjustable devices to original settings, including, but not limited to, dampers, air directional devices, valves, fuses, and circuit breakers.

3.08 WASTE MANAGEMENT

A Double-bag waste and debris in 6 mil, 0.006 inch thick polyethylene plastic bags.
B Dispose of debris off-site in accordance with applicable federal, state and local requirements.

END OF SECTION

SECTION 23 01 50 - MECHANICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 APPLICABILITY

A This section covers basic materials and methods and applies to and forms a part of each of the sections of Division 23.

B This work shall be in accordance with this and other applicable sections and/or provisions of these specifications and with the applicable drawings.

1.2 COORDINATION OF OPENINGS

A This contractor shall coordinate all openings required for new piping, ductwork, equipment, controls, etc. through any structural slabs, beams, or walls. Contractor shall request a copy of the precast concrete shop drawings and verify locations and sizes of all openings required.

B All costs associated with structural field changes or redesigns of the building systems due to lack of field coordination shall be responsibility of this contractor.

1.3 MATERIALS & MANUFACTURERS

A All materials and equipment shall be new, free of defects, installed in accordance with manufacturer's current published recommendations in a neat manner and in accordance with standard practice of the industry.

B Certain materials and/or equipment in this specification are specified by manufacturer and catalog numbers. The design was based on the specified equipment and establishes a degree of quality, performance, physical configuration, etc. If the contractor should elect to use equipment other than the equipment used as a basis for design but listed as "acceptable" in the specifications, he shall be responsible for space requirements, configuration, performance, and changes in bases, supports, vibration isolators, structural members, openings in structure and other apparatus that may be affected by its use.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS INSTALLATION

A Piping is to be installed as shown on the drawings as much as practical. When a pipe size is not indicated, the subcontractor shall request the pipe size from the Architect through the Mechanical Contractor.

B Provide sufficient swing joints, expansion loops, and/or devices necessary and install so as to permit free expansion and contraction of piping without causing undue stresses. Make all changes in direction with fittings. Support piping independently at all equipment so that its weight shall not be supported by the equipment.

C Install piping without springing or forcing and clear all windows, doors, and other openings. Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted.

D All pipes shall be reamed to full pipe diameter before joining.

E Install vertical risers plumb and straight, horizontal lines parallel with walls and partitions. Conceal piping above ceilings and within furring and/or walls (finished construction).

F Provide shut-off valves and unions suitably located to isolate each item of equipment, branch circuit or section of piping.

G Provide solid head plugs on any crosses, tees, etc., located in the piping around the boilers.

H Provide drain valves at all low points of each system to enable complete drainage. Drain shall consist of a 3/4” ball valve with hose end.

I Provide a manual air vent consisting of 1/2" ball valve with hose end installed on a "T" at all high points of each system to enable complete venting.

J All piping shall be adequately supported from the building structure with adjustable hangers to maintain uniform grading where required and to prevent sagging or pocketing.

K Provide supports between piping and building structure where necessary to prevent swaying.

L The use of wire or perforated metal to support pipe will not be permitted.

2.2 SUPPORTING STEEL

A Provide structural steel framework for supporting mechanical equipment as required.

B All steel work shall be in conformance with the requirements of the AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings. Material shall conform to ASTM A36.

PART 3 EXECUTION

3.1 PROTECTION, DELIVERY AND STORAGE OF MATERIALS

A Make provisions for the delivery and storage of materials and make the required arrangements with other contractors for the introduction into the building of equipment too large to pass through finished openings.

B Protect materials and equipment stored on site from weather and moisture by maintaining factory covers and/or suitable weather-proof coverings. For extended outdoor storage, motors shall be removed from equipment and stored separately.

C The open ends of all piping and ductwork shall be covered whenever that system is not being worked on, i.e., end of the workday, completion of a section, etc. Covering shall keep dust, garbage, vermin, and other foreign objects out of the piping or ductwork when the contractor is not on the jobsite.

3.2 CUTTING AND REPAIRING

A All holes and penetrations required for the installation of the mechanical equipment shall be by the mechanical contractor. This shall include all piping, ductwork, and any other penetration through the wall, floor, or roof.

B Cutting construction shall be done only with the written permission of the Architect. Cutting shall be done carefully and damage to buildings, pipes, wiring, or equipment as a result of cutting for installation shall be repaired by skilled mechanics of the trade involved at no additional charge to the Owner. This Contractor shall be responsible for all cutting and patching unless such work has been delegated to the General Contractor.

C All holes cut into concrete shall be cut by means of power saws or core drills. All unsightly spalls or chips shall be repaired.

D All openings remaining around duct and pipe penetrations shall be filled, caulked, and painted to match wall. Code approved fire caulking shall be used for all rated penetrations.

3.3 SEALING FLOOR, CEILINGS AND WALL OPENINGS

A Where pipes or ducts pass through walls, ceilings, floors, or partitions, (other than those through fire rated walls or chases) the opening in the construction around the pipe or duct shall not exceed ½ inch average clearance on all sides and shall be sealed to prevent the passage of sound and air. Coordinate wall openings to allow insulation thickness to pass through walls if allowed.

B The material used to seal space between the wall and the pipe/duct shall be non-combustible caulk type, or wrap type, as conditions require. Provide sheet metal angles or flanges as may be required to contain the stopping material. Use of expanding foam will be allowed if surfaces are cleaned of an excess material and all edges are trimmed smooth. Penetrations through exterior walls shall be sealed weather tight.

C Special attention shall be given to penetrations of mechanical room walls. Fill gaps around entire exterior area of the pipes or ducts with sound insulation (batt or mineral wool) to within ½" of the wall surface. Use silicone caulking to finish filling the opening smooth with the wall surface or provide sheet metal angles. All sealer shall meet flame spread 25 and smoke developed less than 50.

D Where pipes or ducts pass through fire-rated walls, ceilings, floors, vertical service shafts walls, or partitions, the opening in the construction around the pipe or duct shall be fire-stopped to prevent the passage of flame and smoke. All assemblies shall be UL or ASTM listed to provide a fire rating equal to that of the construction being penetrated. For the firestop applications that exist for which no UL tested system is available through a manufacturer, an engineering judgment derived from similar UL system designs or other tests shall be submitted from the manufacturer to the local authorities having jurisdiction for their review and approval prior to installation. Individuals installing the firestopping shall be experienced and certified as required by the manufacturer whose product is being applied. Refer to firestopping specification section for more information.

E Manufacturer's assembly drawings shall be provided in O & M Manuals for each type of penetration. Printed metal or plastic labels shall be permanently applied on the structure within 6" of the edge of the firestop system. Metal labels shall be applied with mechanical fasteners & plastic labels shall be the self-adhering type with adhesive capable of permanently bonding labels to the surfaces on which the labels are placed. The information required on the label include UL/ASTM assembly number, date of installation, fire stopping material manufacture name, Contractor's name, address & phone number & the installer's name.

F Duct coverings shall not extend through walls or floors required to be fire-stopped or have a fire resistance rating. Insulation shall be taped or sealed to the walls to eliminate sweating at any fire and/or smoke dampers.

G Acceptable manufacturers shall be Hilti, 3M Brand, or a prior approved product.

3.4 CLEANING AND PAINTING

A Clear away all debris, surplus materials, etc., resulting from work or operations, leaving the job and equipment furnished under this contract in a clean condition.

B All exposed ductwork visible behind grilles, registers or air terminals shall be painted flat black.

C All equipment being furnished with finished paint coat shall be examined upon job completion for scratches and other surface damage. All finished surfaces where necessary shall be touched up with touch-up paint of color to match the factory finish.

D Paint all exposed bare pipe exterior of the building. Bare pipe shall be painted one coat of No. 7769402 damp-proof red primer as manufactured by Rust-Oleum Corporation, or equal, and one coat of oil paint. Final coat shall be of a color selected by the architect.

E Paint all exposed iron and steel work, pipe hangers, pipe stands, uninsulated tanks, supporting steel for equipment and exposed bare pipe in mechanical areas. Iron and steel work and bare pipe shall be painted one coat of No. 4769402 damp-proof red primer as manufactured by Rust-Oleum Corporation, or equal, and one coat of oil paint. Iron and steel work shall be painted black.

3.5 ASBESTOS FREE BUILDING

A There shall be no products or building materials used as a temporary or permanent element in the construction of this building, which has in its make-up any form of asbestos. The contractors shall be responsible to monitor shop drawings and product literature to verify the make-up of materials to be used in the building and remind material suppliers that their products must be asbestos free.

B Notify the Architect immediately of any existing materials which are suspected of containing asbestos. Do not disturb or attempt to remove any asbestos containing material. The Architect will contact the Owner and inform them of the Contractors observations. The Owner will obtain and provide the services of professionals skilled in asbestos removal.

3.6 SALVAGE

A All items removed from existing building shall be salvaged in a workmanlike manner.

B The handling, storage, and disposition of salvage materials shall be as directed by the Architect. Generally, all salvage material shall remain the property of the Owner. Materials and equipment not wanted by Owner shall be removed from the job site and become the property of the contractor.

END OF SECTION

SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A General construction and requirements.

B Applications.

C Single phase electric motors.

D Three phase electric motors.

E Electronically Commutated Motors (ECM).

1.2 REFERENCE STANDARDS

A ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015 (Reaffirmed 2020).

B IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2017.

C NEMA MG 00001 - Motors and Generators; 2024.

D NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.4 QUALITY ASSURANCE

A Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.6 WARRANTY

A See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1 GENERAL CONSTRUCTION AND REQUIREMENTS

A Electrical Service:
1. Motors 3/4 HP and Smaller: 115 volts, single phase, 60 Hz.
2. Motors Larger than 3/4 Horsepower: Three phase, 60 Hz, motor voltage to be coordinated with electrical drawings.

B Construction:
1. Open drip-proof type except where specifically noted otherwise.
2. Design for continuous operation in 104 degrees F environment.
3. Design for temperature rise in accordance with NEMA MG 00001 limits for insulation class, service factor, and motor enclosure type.

4. All motors shall be premium efficiency type.

C Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

D Wiring Terminations:
1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.2 APPLICATIONS

A Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not comply with these specifications.

B Motors located in exterior locations: Totally enclosed type.

C Motors located in outdoors, in wet air streams downstream of sprayed coil dehumidifiers, in draw through cooling towers, and in humidifiers: Totally enclosed weatherproof epoxy-treated type.

D Motors located in draw through cooling towers: Totally enclosed weatherproof epoxy-sealed type.

2.3 SHAFT GROUNDING

A All motors over 1 HP on variable frequency drives shall be equipped with shaft grounding system to discharge shaft voltage potential to ground. Motors on variable frequency drives shall be bonded from the motor foot to system ground with high frequency grounding strap consisting on tinned, copper strap with terminations to accommodate the motor foot and system ground.

2.4 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A Starting Torque: Less than 150 percent of full load torque.

B Starting Current: Up to seven times full load current.

C Breakdown Torque: Approximately 200 percent of full load torque.

D Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

E Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.5 SINGLE PHASE POWER - CAPACITOR START MOTORS

A Starting Torque: Three times full load torque.

B Starting Current: Less than five times full load current.

C Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

D Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.

E Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.6 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A Starting Torque: Between 1 and 1-1/2 times full load torque.

B Starting Current: Six times full load current.

C Design, Construction, Testing, and Performance: Comply with NEMA MG 00001 for Design B motors.

D Insulation System: NEMA Class B or better.

E Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

F Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

G Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

H Sound Power Levels: To NEMA MG 00001.

I Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.

J Nominal Efficiency: As indicated at full load and rated voltage when tested in accordance with IEEE 112.

K Nominal Power Factor: As indicated at full load and rated voltage when tested in accordance with IEEE 112.

2.7 ELECTRONICALLY COMMUTATED MOTORS (ECM)

A Electronically Commutated Motor
1. Motor to be a DC electronic commutation type motor (ECM) specifically designed for application.
2. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase.
3. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor.
4. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal.

PART 3 EXECUTION

3.1 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A Support and attachment components.

1.2 REFERENCE STANDARDS

A ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

J ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

K FM (AG) - FM Approval Guide; Current Edition.

L MFMA-4 - Metal Framing Standards Publication; 2004.

M MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

N UL (DIR) - Online Certifications Directory; Current Edition.

O UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

C Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A General Requirements:
1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
   a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B Prefabricated Trapeze-Framed Metal Strut Systems:
1. MFMA-4 compliant, pre-fabricated, MSS SP-58 type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.
2. Strut Channel or Bracket Material:
   a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
3. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

C Strut Channels:
1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

D Channel Nuts:
1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring.

E Hanger Rods:
1. Threaded zinc-plated steel unless otherwise indicated.
2. Minimum Size, Unless Otherwise Indicated or Required:
   a. Equipment Supports: 1/2 inch diameter.
   b. Piping up to 1 inch: 1/4 inch diameter.
   c. Piping larger than 1 inch: 3/8 inch diameter.
   d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

F Pipe Supports:
1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
2. Liquid Temperatures Up To 122 degrees F:
   a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
   b. Support From Below: MSS SP-58 Types 35 through 38.
3. Operating Temperatures from 122 to 446 degrees F:
   a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.

G Roller Chairs:
1. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.
2. Steel Yoke Type: MSS SP-58 type 44, vertically adjustable, nonconductive, and corrosion resistant.
3. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.

H Pipe Stanchions:
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
3. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.

I Beam Clamps:
1. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
2. Beam C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
3. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
4. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
5. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.
6. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish,
7. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
8. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

J Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.
4. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.
5. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.

K U-Bolts:
1. MSS SP-58 Type 24, carbon steel u-bolt for pipe support or anchoring.

L Strut Clamps:
1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.

M Insulation Clamps:
1. Two bolt-type clamps designed for installation under insulation.
2. Material: Carbon steel with epoxy copper or zinc finish.

N Pipe Hangers:
1. Split Ring Hangers:

a. Provide hinged split ring and yoke roller hanger with epoxy copper or plain finish.
b. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
c. Provide hanger rod and nuts of the same type and material for a given pipe run.
d. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

2. Clevis Hangers, Adjustable:
   a. Copper Tube: MSS SP-58 Type 1, epoxy-plated copper.
   b. Felt-Lined: MSS SP-58 Type 1, zinc-plated, silicone-free carbon steel.
   c. Light-Duty: MSS SP-58 Type 1, zinc-colored, epoxy plated.
3. V-Bottom Clevis Hangers, Adjustable with Matching V-Channel:
   a. V-Bottom Clevis Hanger:
      1) MSS SP-58 galvanized, carbon steel.
   b. V-Channel
      1) Galvanized carbon steel.

O Intermediate Pipe Guides:
1. Pipe Diameter 6 inch and Smaller: Provide minimum clearance of 0.16 inch.
2. Pipe Sizes 8 inch: 0.625 inch U-bolt with double nuts providing minimum clearance of 0.28 inch.
3. Pipe Size 10 inch: 0.75 inch U-bolt.
4. Pipe Sizes 12 to 16 inch: 0.875 inch U-bolt.
5. Pipe Sizes 18 to 30 inch: 1 inch U-bolt.
6. Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.

P Pipe Alignment Guides: Galvanized steel.
1. Pipe Sizes 8 inch and Smaller: Spider or sleeve type.
2. Pipe Sizes 10 inch and Larger: Roller type.

Q Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

R Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

S Pipe Shields for Insulated Piping:
1. General Construction and Requirements:
   a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
   b. Shields Material: UV-resistant polypropylene with glass fill.
   c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
   d. Minimum Service Temperature: Minus 40 degrees F.
   e. Maximum Service Temperature: 178 degrees F.
   f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

T Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Steel: Use beam-ceiling clamps, beam clamps, machine bolts, or welded threaded studs.

U Rooftop Condensate Supports:
1. Manufacturers:
   a. Mifab, CE10 Extension Series.
   b. B-Line.
2. General:

a. Base Material - 100% recycled rubber.
b. Base Dimensions - 4" Height x 6" width x 9.6" Length.
c. Strut - 14 gauge galvanized steel. Where disimmilar metals are in contact, provide rubber pipe isolators.
d. Rod - Two 1/2" electro zinc lated all threaded rod risers, height as requried to slope piping to discharge location.

PART 3 EXECUTION

3.1 INSTALLATION

A Install products in accordance with manufacturer's instructions.

B Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G Equipment Support and Attachment:
1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H Secure fasteners according to manufacturer's recommended torque settings.

I Remove temporary supports.

END OF SECTION

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A Nameplates.

B Tags.

C Adhesive-backed duct markers.

D Stencils.

E Pipe markers.

F Ceiling tacks.

1.2 RELATED REQUIREMENTS

A Section 09 91 23 - Interior Painting: Identification painting.

1.3 REFERENCE STANDARDS

A ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.

B ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C Product Data: Provide manufacturers catalog literature for each product required.

D Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A Air Terminal Units: Nameplate and Ceiling tacks where located above ceilings.

B Heat Pumps and Fan-Coil Units: Nameplate and Ceiling tacks where located above ceilings.

C Exhaust and Air Transfer Fans: Nameplate and Ceiling tacks where located above ceilings.

D Control Panels: Nameplates.

E Heat Pumps and Fan-Coil Units: Nameplate and Ceiling tags where located above ceilings.

F Heat Transfer Equipment: Nameplates.

G Piping: Adhesive-backed duct markers.

H Pumps: Nameplates.

I Tanks: Nameplates.

J Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 NAMEPLATES

A Letter Color: White.

B Letter Height: 1/4 inch.

C Background Color: Black.

D Plastic: Comply with ASTM D709.

2.3 TAGS

A Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 ADHESIVE-BACKED DUCT MARKERS

A Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch; printed with UV and chemical resistant inks.

B Style: Individual Label.

C Color: Yellow/Black.

2.5 STENCILS

A Stencils: With clean cut symbols and letters of following size:
1. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
2. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
3. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
4. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
5. Ductwork and Equipment: 2-1/2 inch high letters.

B Stencil Paint: As specified in Section 09 91 23, semi-gloss enamel, colors complying with ASME A13.1.

2.6 PIPE MARKERS

A Color: Comply with ASME A13.1.

B Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

D Ammonia Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

2.7 CEILING TACKS

A Description: Adhesive backed 3/4 inch diameter sticker, color coded.

B Color code as follows:
1. HVAC Equipment: Yellow.
2. Fire Dampers and Smoke Dampers: Red.
3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.1 INSTALLATION

A Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B Install tags with corrosion resistant chain.

C Apply ASME A13.1 Pipe Marking Rules:
1. Place pipe marker adjacent to changes in direction.
2. Place pipe marker adjacent each valve port and flange end.
3. Place pipe marker at both sides of floor and wall penetrations.
4. Place pipe marker every 25 to 50 feet interval of straight run.

D Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

E Place Ceiling Tacks on ceiling grid at locations of all above ceiling equipment, terminal boxes, valves, etc.

END OF SECTION

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A Section 01 91 13 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

B Section 23 08 00 - Commissioning of HVAC.

1.2 REFERENCE STANDARDS

A ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).

1.3 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
1. Submit to the Commissioning Authority.
2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
3. Include at least the following in the plan:
   a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
   b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
   c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
   d. Final test report forms to be used.
   e. Procedures for formal deficiency reports, including scope, frequency and distribution.

C Field Logs: Submit at least twice a week to the Commissioning Authority.

D Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

E Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
1. Revise TAB plan to reflect actual procedures and submit as part of final report.
2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A Perform total system balance in accordance with one of the following:

B Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

3.2 AIR SYSTEM PROCEDURE

A Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C Measure air quantities at air inlets and outlets.

D Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

N For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

O On fan powered VAV boxes, adjust air flow switches for proper operation.

3.3 WATER SYSTEM PROCEDURE

A Adjust water systems to provide required or design quantities.

B Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D Effect system balance with automatic control valves fully open to heat transfer elements.

E Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.4 COMMISSIONING

A See Sections 01 91 13 - General Commissioning Requirements and 23 08 00 for additional requirements.

B Perform prerequisites prior to starting commissioning activities.

C Fill out Prefunctional Checklists for:
1. Air side systems.
2. Water side systems.

D Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

E Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for ___ percent of the air handlers plus a random sample equivalent to ____ percent of the final TAB report data as directed by Commissioning Authority.
1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
2. Use the same test instruments as used in the original TAB work.
3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
4. For purposes of re-check, failure is defined as follows:
   a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
   b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
   c. Temperatures: Deviation of more than one degree F.
   d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
   e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.

F In the presence of the Commissioning Authority, verify that:
1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.
3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

3.5 SCOPE

A Test, adjust, and balance the following:
1. Plumbing Pumps.

2. HVAC Pumps.
3. Chillers.
4. Cooling Towers.
5. Packaged Roof Top Heating/Cooling Units.
6. Air Coils.
7. Air Handling Units.
8. Fans.
9. Air Terminal Units.
10. Air Inlets and Outlets.

3.6 MINIMUM DATA TO BE REPORTED

A Electric Motors:
1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

B V-Belt Drives:
1. Identification/location.
2. Required driven RPM.
3. Driven sheave, diameter and RPM.
4. Belt, size and quantity.
5. Motor sheave diameter and RPM.
6. Center to center distance, maximum, minimum, and actual.

C Pumps:
1. Identification/number.
2. Manufacturer.
3. Size/model.
4. Impeller.
5. Service.
6. Design flow rate, pressure drop, BHP.
7. Actual flow rate, pressure drop, BHP.
8. Discharge pressure.
9. Suction pressure.
10. Total operating head pressure.
11. Shut off, discharge and suction pressures.
12. Shut off, total head pressure.

D Chillers:
1. Identification/number.
2. Manufacturer.
3. Capacity.
4. Model number.
5. Serial number.
6. Evaporator entering water temperature, design and actual.
7. Evaporator leaving water temperature, design and actual.
8. Evaporator pressure drop, design and actual.
9. Evaporator water flow rate, design and actual.
10. Condenser entering water temperature, design and actual.
11. Condenser pressure drop, design and actual.

12. Condenser water flow rate, design and actual.

E Cooling Tower:
1. Tower identification/number.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Rated capacity.
6. Condenser water entering temperature.
7. Condenser water leaving temperature.
8. Condenser water flow rate.
9. Fan RPM.

F Heat Exchangers:
1. Identification/number.
2. Service.
3. Manufacturer.
4. Model number.
5. Serial number.
6. Primary water entering temperature, design and actual.
7. Primary water leaving temperature, design and actual.
8. Primary water flow, design and actual.
9. Primary water pressure drop, design and actual.
10. Secondary water leaving temperature, design and actual.
11. Secondary water flow, design and actual.
12. Secondary water pressure drop, design and actual.

G Cooling Coils:
1. Identification/number.
2. Service.
3. Air flow, design and actual.
4. Water flow, design and actual.
5. Water pressure drop, design and actual.
6. Entering water temperature, design and actual.
7. Leaving water temperature, design and actual.
8. Air pressure drop, design and actual.

H Heating Coils:
1. Identification/number.
2. Service.
3. Manufacturer.
4. Air flow, design and actual.
5. Water flow, design and actual.
6. Entering water temperature, design and actual.
7. Air pressure drop, design and actual.

I Electric Duct Heaters:
1. Identification/number.
2. Model number.
3. Design kW.
4. Number of stages.
5. Phase, voltage, amperage.
6. Test voltage (each phase).
7. Test amperage (each phase).
8. Air flow, specified and actual.

J Air Moving Equipment:

1. Manufacturer.
2. Model number.
3. Serial number.
4. Arrangement/Class/Discharge.
5. Air flow, specified and actual.
6. Return air flow, specified and actual.
7. Outside air flow, specified and actual.
8. Total static pressure (total external), specified and actual.
9. Inlet pressure.
10. Discharge pressure.
11. Sheave Make/Size/Bore.
12. Number of Belts/Make/Size.
13. Fan RPM.

K Duct Traverses:
1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.

L Duct Leak Tests:
1. Description of ductwork under test.
2. Duct design operating pressure.
3. Duct design test static pressure.
4. Duct capacity, air flow.
5. Maximum allowable leakage duct capacity times leak factor.
6. Test static pressure.
7. Test orifice differential pressure.
8. Leakage.

M Air Monitoring Stations:
1. Identification/location.
2. System.
3. Size.
4. Area.
5. Design velocity.
6. Design air flow.
7. Test velocity.
8. Test air flow.

N Flow Measuring Stations:
1. Identification/number.
2. Location.
3. Size.
4. Manufacturer.
5. Model number.
6. Serial number.
7. Design Flow rate.
8. Design pressure drop.
9. Actual/final pressure drop.
10. Actual/final flow rate.

11. Station calibrated setting.

O Terminal Unit Data:
1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Model number.
5. Size.
6. Minimum static pressure.
7. Minimum design air flow.
8. Maximum design air flow.
9. Maximum actual air flow.
10. Inlet static pressure.

P Air Distribution Tests:
1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

END OF SECTION

SECTION 23 07 13 - DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A Duct insulation.

B Duct liner.

C Weather barrier coatings.

D Jacketing and accessories.

1.2 REFERENCE STANDARDS

A ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

B ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

C ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.

D ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.

E ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019 (Reapproved 2022).

F ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers; 2015 (Reapproved 2022).

G ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.

H ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay; 2017 (Reapproved 2021).

I ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

J ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

K ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

L SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.

M SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

N UL 181A - Closure Systems for Use with Rigid Air Ducts; Current Edition, Including All Revisions.

O UL 181B - Closure Systems for Use with Flexible Air Ducts and Air Connectors; Current Edition, Including All Revisions.

P UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.4 DELIVERY, STORAGE, AND HANDLING

A Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.5 FIELD CONDITIONS

A Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A Manufacturer:
1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
2. Johns Manville; _____: www.jm.com/#sle.
3. JP Lamborn Co; Thermal Sleeve MT: www.jpflex.com/#sle.
4. Knauf Insulation: www.knaufinsulation.com/#sle.

B Insulation: ASTM C553; flexible, noncombustible blanket.

C Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with pressure-sensitive tape.

D Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

E Indoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

F Outdoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.3 GLASS FIBER, RIGID

A Manufacturer:
1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
2. Johns Manville; _____: www.jm.com/#sle.
3. Knauf Insulation; _____: www.knaufinsulation.com/#sle.
4. Owens Corning Corporation; 700 Series FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.

B Insulation: ASTM C612; rigid, noncombustible blanket.

C Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with pressure-sensitive tape.

D Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

2.4 WEATHER BARRIER COATINGS

A Weather-Resistive Barrier Coating: Fire-resistive, UV resistant, water-based mastic for use over closed cell polyethylene and polyurethane foam insulation; applied with glass fiber or synthetic reinforcing mesh.
1. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A, when tested in accordance with ASTM E84.
2. Water Vapor Permeance: Greater than 1.0 perm in accordance with ASTM E96/E96M.
3. Resistance to Fungal Growth: No growth when tested in accordance with ASTM D5590.
4. Color: As selected by Architect.

2.5 JACKETING AND ACCESSORIES

A Flexible Weather-Proofing Outdoor Jacket: Self-healing, field-applied outdoor cladding.
1. Material: Aluminum foil/polymer laminate with rubberized asphalt layer and acrylic adhesive.
2. Thickness: 34 mil, 0.034 inch.
3. Finish: Embossed.
4. Color: Silver.
5. Water Vapor Transmission: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
6. Mold Resistance: Pass when tested in accordance with ASTM C1338.
7. Emissivity: 0.30 when tested in accordance with ASTM C1371.

B Reinforced Tape:
1. FSK tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.
2. Comply with UL 723 or ASTM E84.
3. Moisture Vapor Permeability: 0.00 perm inch, when tested in accordance with ASTM E96/E96M.

C Plain Foil Tape:
1. Aluminum foil with pressure-sensitive adhesive on paper release liner.

D UL181 Tape for Rigid and Flexible Ductwork:
1. Comply with UL 181A for rigid ductwork.
2. Comply with UL 181B for flexible ductwork.
3. Aluminum foil coated with pressure-sensitive adhesive on paper release liner.
4. Foil tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.

2.6 DUCT LINER

A Note: Choose the liner type - Elastomeric Foam, Glass Fiber, or Phenolic Foam.

B Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
1. Fungal Resistance: No growth when tested according to ASTM G21.
2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
3. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.

C Adhesive: Waterproof, fire-retardant type, ASTM C916.

PART 3 EXECUTION

3.1 EXAMINATION

A Test ductwork for design pressure prior to applying insulation materials.

B Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Insulated Ducts Conveying Air Below Ambient Temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C Exterior Applications: Provide insulation with vapor barrier jacket. Cover with caulked aluminum jacket with seams located on bottom side of horizontal duct section.

D Slope exterior ductwork to shed water.

E Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

A Exhaust Ducts Within 10 ft of Exterior Openings:

B Outside Air Intake Ducts:

C Supply Ducts:

D Supply Ducts From Fans to Vertical Ducts in Shafts (Cooling System):

E Supply Ducts in Vertical Shafts (Cooling Systems):

F Ducts Exposed to Outdoors:

END OF SECTION

SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A Section 07 84 00 - Firestopping.

1.2 REFERENCE STANDARDS

A ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.

B ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

C ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

D ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).

E ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2019).

F ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

G ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

H ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

I ASTM C1126 - Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation; 2019.

J ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation; 2023.

K ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.

L ASTM D610 - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces; 2008 (Reapproved 2019).

M ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2016 (Reapproved 2023).

N ASTM D1623 - Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics; 2017 (Reapproved 2023).

O ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

P ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

Q ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

R ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

S ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

T SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.

U UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER, RIGID

A Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
1. K Value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum Service Temperature: 850 degrees F.
3. Maximum Moisture Absorption: 0.2 percent by volume.

B Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

C Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D Vapor Barrier Lap Adhesive: Compatible with insulation.

E Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

F Insulating Cement: ASTM C449.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A Manufacturers:
1. Aeroflex USA, Inc; AEROFLEX Self-Seal: www.aeroflexusa.com/#sle.
2. Armacell LLC; ArmaFlex Ultra with FlameDefense: www.armacell.us/#sle.
3. K-Flex USA LLC; K-Flex Titan: www.kflexusa.com/#sle.

B Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 180 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

C Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

D Weather Barrier Coating: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.

2.4 RIGID, CELLULAR PHENOLIC

A Manufacturers:
1. Dyplast Products, LLC; _____: www.dyplastproducts.com/#sle.
2. ITW Insulation Systems; _____: www.itwinsulation.com/#sle.
3. Polyguard Products; PolyPhen: www.polyguardproducts.com.com/#sle.

B Insulation: ASTM C1126, Type III, Grade 1.
1. Nominal Density: 3.75 pcf.
2. Preliminary Initial Minimum K Value: 0.145 at 50 degrees F based on density of 2.5 pcf.
3. Maximum Service Temperature: 248 degrees F.
4. Minimum Service Temperature: Minus 292 degrees F.

5. Minimum compressive strength as determined by ASTM D1621.
6. Minimum tensile strength as determined by ASTM D1623.

2.5 JACKETING AND ACCESSORIES

A ABS Plastic:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
   a. Minimum Service Temperature: Minus 40 degrees F.
   b. Maximum Service Temperature: 180 degrees F.
   c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
   d. Thickness: 30 mil, 0.030 inch.
   e. Connections: Brush on welding adhesive.

B Aluminum Jacket:
1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
2. Thickness: 0.016 inch sheet.
3. Type: Factory-applied, self-adhesive jacketing.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

C Reinforced Tape:
1. FSK tape suitable for sealing seams between insulation, insulated pipe bends, and fittings resulting in a tight, smooth surface without wrinkles.
2. Comply with UL 723, ASTM E84.
3. Moisture Vapor Permeability: 0.00 perm inch, when tested in accordance with ASTM E96/E96M.

2.6 ENGINEERED WALL OUTLET SEALS AND REFRIGERANT PIPING INSULATION PROTECTION

A Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
1. Wall Outlet Size, Stucco and Masonry Applications: 7-1/2 inch wide by 10 inch high.
   a. Elastomeric Sleeve Diameter: 1-11/16 inch.
2. Outlet Cover Color: Gray.
3. Water Penetration: Comply with ASTM E331.
4. Air Leakage: Comply with ASTM E283.
5. Air Permeance: Comply with ASTM E2178.

B Insulation Protection System: Refrigerant piping insulation PVC protective cover.
1. PVC Insulation Cover Color: Black with full-length velcro fastener.
2. Flame Spread and Smoke Development Rating of 24/450: Comply with ASTM E84 or UL 723.

2.7 ACCESSORIES

A General Requirements:
1. Provide required accessories in accordance with and subject to the recommendations of the insulation manufacturer.
2. Furnish compatible materials which do not contribute to corrosion, soften, or otherwise attack surfaces to which applied, in either the wet or dry state.
3. Comply with ASTM C795 requirements for materials to be used on stainless steel surfaces.
4. Supply materials that are asbestos free.

B Corrosion Inhibitors:
1. Corrosion Control Gel:
   a. Corrosion Protection: Comply with ASTM B117 and ASTM D610.

PART 3 EXECUTION

3.1 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Insulated Pipes Conveying Fluids Below Ambient Temperature:
1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

C For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

D Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

E Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

F Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 84 00.

G Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

H Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.2 SCHEDULE

A Heating Systems:
1. Heating Water Supply and Return: 2 inch, Fiber Glass, Ridged

B Cooling Systems:
1. Chilled Water: 2 inch, Cellular Phenolic, Rigid

C Other Systems:
1. Piping Exposed to Freezing with Heat Tracing:

END OF SECTION

SECTION 23 09 34 - VARIABLE-FREQUENCY MOTOR CONTROLLERS FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A Variable-frequency motor controllers for low-voltage (600 V and less) AC motor applications.

B Overcurrent protective devices for motor controllers, including overload relays.

1.2 RELATED REQUIREMENTS

A Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

B Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1.3 REFERENCE STANDARDS

A IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

B IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

C NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).

E NEMA ICS 7 - Industrial Control and Systems: Adjustable-Speed Drives; 2020.

F NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable-Speed Drive Systems; 2022.

G NEMA ICS 7.2 - Application Guide for AC Adjustable Speed Drive Systems; 2021.

H NEMA ICS 61800-2 - Adjustable Speed Electrical Power Drive Systems, Part 2: General Requirements-Rating Specifications for Low Voltage Adjustable Frequency AC Power Drive Systems; 2005.

I NEMA MG 00001 - Motors and Generators; 2024.

J NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

K NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

N UL 61800-5-1 - Standard for Adjustable Speed Electrical Power Drive Systems - Part 5-1: Safety Requirements – Electrical, Thermal, and Energy (Ed. 2); Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate work to provide motor controllers suitable for use with actual motors to be installed.
2. Coordinate work to provide controllers and associated wiring suitable for interface with control devices to be installed.
3. Coordinate arrangement with dimensions and clearance requirements of actual equipment to be installed.
4. Verify with manufacturer that conductor terminations are suitable for use with conductors to be installed.

5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

C Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Include wiring diagrams showing factory and field connections.

D Specimen Warranty: Submit sample of manufacturer's warranty.

E Manufacturer's equipment seismic qualification certification.

F Manufacturer's certification that products meet or exceed specified requirements.

G Field quality control test reports.

H Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

I Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A Store in clean, dry space. Maintain factory wrapping or provide additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

1.8 WARRANTY

A See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B Provide minimum Five year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A ABB; ACH580: www.abbnow.com

B Danfoss.

2.2 VARIABLE-FREQUENCY MOTOR CONTROLLERS

A Provide variable-frequency motor control system consisting of required controller assemblies, operator interfaces, control power transformers, instrumentation and control wiring, sensors, accessories, system programming, etc. as necessary for complete operating system.

B Provide products listed, classified, and labeled as suitable for purpose intended.

C Variable-Frequency Motor Controller:
1. Configuration: Packaged controller with across-the-line bypass.
2. Rectifier/Converter: Diode-based, 6-pulse type.
3. Control Method: Scalar/volts per hertz; open-loop, without feedback.
4. Filtering: Provide input/line reactor and output/load reactor.

D Controller Assemblies: Comply with NEMA ICS 7, NEMA ICS 7.1, and NEMA ICS 61800-2; list and label as complying with UL 61800-5-1 or UL 508A as applicable.

E Provide controllers selected for actual installed motors and coupled mechanical loads in accordance with NEMA ICS 7.2, NEMA MG 00001 Part 30, and recommendations of manufacturers of both controller and load, where not in conflict with specified requirements; considerations include, but are not limited to:
1. Motor type (e.g., induction, reluctance, and permanent magnet); consider NEMA MG 00001 design letter or inverter duty rating for induction motors.
2. Motor load type (e.g., constant torque, variable torque, and constant horsepower); consider duty cycle, impact loads, and high inertia loads.
3. Motor nameplate data.
4. Requirements for speed control range, speed regulation, and braking.
5. Motor suitability for bypass starting method, where applicable.

F Single Controllers Serving Multiple Motors:
1. Control Method: Scalar/volts per hertz; do not use vector control method.
2. Provide separate overload relay for each motor; provide auxiliary contacts and control wiring as required to shut down controller upon trip of any single overload relay.
3. Consider combined length of motor leads for cable length limits.

G Devices on Load Side of Controller: Suitable for application across full controller output frequency range.

H Operating Requirements:
1. Input Voltage Tolerance: Plus/minus 10 percent of nominal.
2. Input Frequency Tolerance: Plus/minus 5 percent of nominal.
3. Efficiency: Minimum of 96 percent at full speed and load.
4. Input Displacement Power Factor: Minimum of 0.96 throughout speed and load range.
5. Overload Rating:
   a. Variable Torque Loads: Minimum of 110 percent of nominal for 60 seconds.
   b. Constant Torque Loads: Minimum of 150 percent of nominal for 60 seconds.

I Power Conversion System: Microprocessor-based, pulse width modulation type consisting of rectifier/converter, DC bus/link, and inverter.
1. Rectifier/Converter: Diode-based, 6-pulse type with 5 percent reactor unless otherwise indicated.

J Control System:
1. Provide microprocessor-based control system for automatic control, monitoring, and protection of motors. Include sensors, wiring, and connections necessary for functions and status/alarm indications specified.
2. Provide integral operator interface for controller programming, display of status/alarm indications, fault reset, and local control functions including motor run/stop, motor forward/reverse selection, motor speed increase/decrease, and local/remote control selection.
3. Control Functions:
   a. Control Method: Selectable vector and scalar/volts per hertz unless otherwise indicated.
      1) Scalar/Volts per Hertz Control: Provide IR compensation or _____ for improved low-speed torque.
      2) Vector Control: Provide selectable autotuning function.
   b. Adjustable acceleration and deceleration time; linear and S-curve ramps; selectable coast to stop.
   c. Selectable braking control; DC injection or flux braking.
   d. Adjustable minimum/maximum speed limits.

e. Adjustable pulse width modulation switching carrier frequency.
f. Adjustable motor slip compensation.
g. Selectable autorestart after noncritical fault; programmable number of time delay between restart attempts.

4. Status Indications:
   a. Motor run/stop status.
   b. Motor forward/reverse status.
   c. Hand/Auto control status.
   d. Output voltage.
   e. Output current.
   f. Output frequency.
   g. DC bus voltage.
   h. Motor speed.
5. Protective Functions/Alarm Indications:
   a. Overcurrent.
   b. Motor overload.
   c. Undervoltage.
   d. Overvoltage.
   e. Controller overtemperature.
   f. Input/output phase loss.
   g. Output short circuit protection.
   h. Output ground fault protection.
6. Inputs:
   a. Digital Input(s): _____.
   b. Analog Input(s): Two.
7. Outputs:
   a. Analog Output(s): Two.
   b. Relay Output(s): Three.
8. Communications: Compatible with connected systems. Provide accessories necessary for proper interface.
   a. Serial Communications: RS-485; support for BACnet MS/TP protocol.
   b. Ethernet Communications: Support for Modbus TCP and BACnet IP protocol.
   c. Remote Monitoring Capabilities:
      1) Motor run/stop status.
      2) Hand-off-auto status.
      3) Fault information.
      4) Discrete input/output status.
      5) Analog input/output values.
9. Features:
   a. Password-protected security access.
   b. Event log.

K Power Conditioning/Filtering:
1. Provide 5-percent DC link chokes or 5-percent input/line reactor for each controller unless otherwise indicated or required.
2. Reactor Impedance: 5 percent, unless otherwise indicated or required.

L Packaged Controllers: Controllers factory-mounted in separate enclosure with externally operable disconnect and specified accessories.
1. Disconnects: Circuit breaker or disconnect switch type.
   a. Disconnect Switches: Fusible type or nonfusible type with separate input fuses.
   b. Provide externally operable handle with means for locking in OFF position. Provide safety interlock to prevent opening cover with disconnect in ON position with capability of overriding interlock for testing purposes.

c. The drive and bypass packaged shall have a UL listed short circuit current rating of 100 kA, for 240VAC and 480 VAC systems, and this rating shall be indicated on the rating label.
d. Provide auxiliary interlock for disconnection of external control power sources where applicable.

2. Provide door-mounted remote operator interface.
3. Packaged Controllers with Bypass: Provide contactors and controls to enable removal of variable-frequency controller from circuit.
   a. Bypass Method: Manual, unless otherwise indicated.
   b. Bypass Configuration: Drive isolation fuses shall be provided. Bypass designs which have no such fuses, or that only incorporate fuses common to both the drive and the bypass are not acceptable. Third contactor “isolation contactors” and service switch are not an acceptable alternative to drive isolation fuses.
   c. Bypass Motor Starting Method: Full-voltage (across-the-line) with overload relay, unless otherwise indicated. The bypass shall be able to detect a single-phase input power condition while running in bypass, disengage the motor, and provide a single-phase input power indication.
   d. Overload Relays: Selectable Class 10, 20, or 30 electronic motor overload protection shall be included in both drive and bypass mode..
4. Independent Bypass Keypad Requirements:
   a. The bypass shall include a two-line, 20-character LCD display. The display shall allow the user to access parameters and view:
      1) Bypass input voltage, current (Amps) and power (kW)
      2) Bypass faults, warnings, and fault log
      3) Bypass operating time and energy consumption (resettable)
   b. The bypass control panel shall include the following controls:
      1) Four navigation keys (Up, Down, Enter, Escape)
      2) Bypass Hand-Off-Auto, Drive mode / Bypass mode selectors, Bypass reset
   c. The following indicating lights (LED type) or control panel display indications shall be provided.
      1) Bypass Mode Selector Switch: DRIVE/OFF/BYPASS.
      2) Motor Control Selector Switch: HAND/OFF/AUTO.
      3) Indicating Lights: For drive/bypass mode status, drive/bypass run status, and drive/bypass fault status.
      4) Safety interlock and run permissive status shall be displayed using predetermined application specific nomenclature, such as: Damper end switch, smoke alarm, vibration trip, and overpressure.
      5) The bypass shall be designed for stand-alone operation and be completely functional in both Hand and Automatic modes, even if the drive and/or drive’s control board has failed. Network communications shall remain functional. Bypass systems that do not maintain full functionality in the event of a drive failure, are not acceptable.

M Service Conditions:
1. Provide controllers and associated components suitable for operation under following service conditions without derating:
   a. Altitude: Less than 3,300 feet.
   b. Ambient Temperature: Between 32 degrees F and 104 degrees F.
2. Provide controllers and associated components suitable for operation at indicated ratings under service conditions at installed location.

N Short Circuit Current Rating:
1. Provide controllers with listed short circuit current rating not less than available fault current at installed location as indicated on drawings.
2. Provide line/input reactors where specified by manufacturer for required short circuit current rating.

O Conductor Terminations: Suitable for use with conductors to be installed.

P Enclosures:
1. Comply with NEMA ICS 6.
2. NEMA EN 10250 Environment Type or Equivalent IEC 60529 Rating: Unless otherwise indicated, as specified for following installation locations:
   a. Indoor Clean, Dry Locations: Type 1 or Type 12.
   b. Outdoor Locations: Type 3R or Type 4.
3. Finish: Manufacturer's standard unless otherwise indicated.
4. Cooling: Forced air or natural convection as determined by manufacturer.

Q Instrument Transformers:
1. Comply with IEEE C57.13.
2. Select suitable ratio, burden, and accuracy as required for connected devices.
3. Current Transformers: Connect secondaries to shorting terminal blocks.
4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.3 OVERCURRENT PROTECTIVE DEVICES

A Circuit Breakers:
1. Molded Case Circuit Breakers:
   a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated or as required.
      1) Provide thermal magnetic circuit breakers unless otherwise indicated.
   b. Interrupting Capacity:
      1) Provide circuit breakers with a 100 KAIC interrupting capacity as required to provide short circuit current rating indicated, but not less than specified minimum requirements.
      2) Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than short circuit current rating indicated.
      3) Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than short circuit current rating indicated.
   c. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   d. Provide following features and accessories where indicated or where required to complete installation:
      1) Pad-Lock Provision: For locking circuit breaker handle in OFF position.
      2) Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
      3) Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
      4) Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.4 SECURITY FEATURES:

A The drive manufacture shall clearly define cybersecurity capabilities for their products.

B The drive shall include password protection against parameter changes.
1. There shall be multiple levels of password protection including: End User, Service, Advanced, and Override.
2. The drive shall support a customer generated unique password between 0 and 99,999,999.
3. The drive shall log an event whenever the drive password has been entered.
4. The drive shall provide a security selection that prevents any “back door” entry. This selection even prevents the drive manufacturer from being able to bypass the security of that drive.
5. A security level shall be available that prevents the drive from being flashed with new firmware.

2.5 NETWORK COMMUNICATIONS:

A The drive shall have an EIA-485 port with removable terminal blocks. The onboard protocols shall be BACnet MS/TP, Modbus, and Johnson Controls N2. Optional communication cards for BACnet/IP, LonWorks, Profibus, Profinet, EtherNet/IP, Modbus TCP, and DeviceNet shall be available. The use of third party gateways are not acceptable.

B The drive shall have the ability to communicate via two protocols at the same time, one onboard protocol and one option card based protocol. Once installed, the drive shall automatically recognize any optional communication cards without the need for additional programming.

C The drive shall not require a power cycle after communication parameters have been updated.

D The embedded BACnet connection shall be a MS/TP interface. The drive shall be BTL Listed to Revision 14 or later. Use of non-BTL Listed drives are not acceptable.

E The drive shall be classified as an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:
1. Data Sharing: Read Property Multiple-B, Write Property Multiple-B, COV-B
2. Device Management: Time Synchronization-B
3. Object Type Support: MSV, Loop

2.6 SOURCE QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Factory test controllers in accordance with NEMA ICS 61800-2.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that ratings of controllers are consistent with indicated requirements.

C Verify that mounting surfaces are ready to accept controllers.

D Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Install products in accordance with manufacturer's instructions.

B Install in accordance with NEMA ICS 7.1 and manufacturer's instructions.

C Do not exceed manufacturer's recommended maximum cable length between controller and motor.

D Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E Provide required support and attachment in accordance with Section 23 05 29.

F Install controllers plumb and level.

G Provide grounding and bonding in accordance with Section 26 05 26.

H Install field-installed devices, components, and accessories.

I Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

J Set field-adjustable settings of controllers and associated components according to installed motor requirements, in accordance with recommendations of manufacturers of controller and load.

3.3 FIELD QUALITY CONTROL

A Provide services of manufacturer's authorized representative to perform inspection and testing. Include manufacturer's reports with submittals.

B Inspect and test in accordance with NETA ATS, except Section 4.

C Perform inspections and tests listed in NETA ATS, Section 7.17. Insulation-resistance test on control wiring listed as optional is not required.

D Packaged Controllers with Bypass: Test for proper operation in both drive and bypass modes.

E Correct deficiencies and replace damaged or defective controllers or associated components.

3.4 PRODUCT SUPPORT

A Factory trained application engineering and service personnel that are thoroughly familiar with the drive products offered shall be locally available at both the specifying and installation locations. A toll free 24/365 technical support line connected to factory support personnel located in the US and Canada shall be available.

B Training shall include installation, programming and operation of the drive, bypass and network communications. Owner training shall be provided locally upon request.

END OF SECTION

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A Hydronic system requirements.

B Heating water and glycol piping, above grade.

C Chilled water piping, above grade.

D Condenser water piping, above grade.

E Condensate drain piping.

F Equipment drains and overflows.

G Pipe hangers and supports.

H Unions, flanges, mechanical couplings, and dielectric connections.

I Valves:
1. Ball valves.
2. Butterfly valves.
3. Check valves.

1.2 RELATED REQUIREMENTS

A Section 08 31 00 - Access Doors and Panels.

B Section 23 07 19 - HVAC Piping Insulation.

C Section 23 25 00 - HVAC Water Treatment: Pipe cleaning.

1.3 REFERENCE STANDARDS

A ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

B ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

C ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

D ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

E ASME B31.9 - Building Services Piping; 2020.

F ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

G ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2019a.

H ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

I ASTM B32 - Standard Specification for Solder Metal; 2020.

J ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

K ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

L ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 2024.

M ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2019).

N AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

O AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

P AWWA C606 - Grooved and Shouldered Joints; 2022.

Q MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data:
1. Include data on pipe materials, pipe fittings, valves, and accessories.

1.5 QUALITY ASSURANCE

A Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A Provide temporary protective coating on cast iron and steel valves.

PART 2 PRODUCTS

2.1 HYDRONIC SYSTEM REQUIREMENTS

A Comply with ASME B31.9 and applicable federal, state, and local regulations.

B Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
3. Grooved mechanical joints may be used in any location.
   a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
   b. Grooved mechanical connections and joints comply with AWWA C606.
   c. Use rigid joints unless otherwise indicated.
4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D Valves: Provide valves where indicated:
1. Provide drain valves where indicated, and if not indicated, provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.
2. On discharge of condenser water pumps, use spring-loaded check valves.
3. Isolate equipment using butterfly valves with lug end flanges or grooved mechanical couplings.
4. For throttling, bypass, or manual flow control services, use ball or butterfly valves.
5. For throttling and isolation service in chilled and condenser water systems, use only butterfly valves.
6. For shut-off and to isolate parts of systems or vertical risers, use ball or butterfly valves.

E Welding Materials and Procedures: Comply with ASME BPVC-IX.

2.2 HEATING WATER PIPING, ABOVE GRADE

A Steel Pipe: ASTM A53/A53M or ASTM A106/A106M, Schedule 40, black, using one of the following joint types:
1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
2. Threaded Joints: ASME B16.3, malleable iron fittings.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

B Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn, using one of the following joint types:
1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
   a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
   b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.

2.3 CHILLED WATER PIPING, ABOVE GRADE

A Steel Pipe: ASTM A53/A53M or ASTM A106/A106M , Schedule 40, black; using one of the following joint types:
1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
2. Threaded Joints: ASME B16.3, malleable iron fittings.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

B Copper Tube: ASTM B88 (ASTM B88M), Type K (A), hard drawn; using one of the following joint types:
1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
   a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
   b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
2. Mechanical Press Sealed Fittings: Double pressed type complying with ASME B16.22, utilizing EPDM, nontoxic synthetic rubber sealing elements.

2.4 CONDENSATE DRAIN PIPING, ABOVE GRADE

A Steel Pipe: ASTM A53/A53M, Schedule 40, galvanized.
1. Threaded Joints: ASME B16.3, malleable iron fittings with finish matching piping.
2. Cold Press Mechanical Joints: Mechanical joint fitting system shall conforming to material requirements of ASTM A420 or ASME B16.3 and performance criteria ANSI LC-4/CSA 6.32.

B Copper Tube: ASTM B88 (ASTM B88M), Type K (A), hard drawn; using one of the following joint types:
1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
   a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

2.5 CONDENSER WATER PIPING, ABOVE GRADE

A Steel Pipe: ASTM A53/A53M or ASTM A106/A106M, Schedule 40, black.
1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings with finish matching piping; AWS D1.1/D1.1M welded.
2. Threaded Joints: ASME B16.3, malleable iron fittings with finish matching piping.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

2.6 EQUIPMENT DRAINS AND OVERFLOWS

A Steel Pipe: ASTM A53/A53M, Schedule 40 galvanized; using one of the following joint types:
1. Threaded Joints: Galvanized cast iron, or ASME B16.3 malleable iron fittings.

2.7 PIPE HANGERS AND SUPPORTS

A Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches and Greater: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 Inches and Greater: Adjustable steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Greater: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
9. Wall Support for Pipe Sizes 4 Inches and Greater: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 Inches and Greater: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 Inches and Greater: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
16. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
17. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

B In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge-shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.8 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A Unions for Pipe of 2 Inches and Less:
1. Ferrous Piping: 150 psi brass or malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

B Flanges for Pipe 2 Inches and Greater:
1. Ferrous Piping: 150 psig forged steel, slip-on.
2. Copper Piping: Bronze.
3. Gaskets: 1/16 inch thick, preformed neoprene.

C Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
1. Dimensions and Testing: In accordance with AWWA C606.
2. Mechanical Couplings: Comply with ASTM F1476.
3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

D Dielectric Connections:
1. Waterways:
   a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
   b. Dry insulation barrier able to withstand 600-volt breakdown test.
   c. Construct of galvanized steel with threaded end connections to match connecting piping.
   d. Suitable for the required operating pressures and temperatures.
2. Flanges:

a. Dielectric flanges with same pressure ratings as standard flanges.
b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
c. Dry insulation barrier able to withstand 600-volt breakdown test.
d. Construct of galvanized steel with threaded end connections to match connecting piping.
e. Suitable for the required operating pressures and temperatures.

3. Unions:
a. 1/2 to 1 Inches: Brass solder to galvanized FPT.
b. 1/2 to 2 Inches: Brass solder to galvanized FPT.
c. 1/2 to 1 Inches: Brass to galvanized FPT or FIP (Female Iron Pipe).
d. 3/4 to 1/2 Inch Reducer: Brass solder to galvanized FPT.
e. Service: 250 psi, minus 20 to 180 deg F.

2.9 ACCEPTABLE VALVE MANUFACTURES

A Manufacturers:
1. Apollo Valves
2. Nibco
3. Victaulic Company
4. Watts Corporation

2.10 BALL VALVES

A Up To and Including 2 Inches:
1. Bronze two piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

2.11 BUTTERFLY VALVES

A Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer, lug, grooved, or _____ ends, extended neck.

B Disc: Construct of aluminum bronze, chrome plated ductile iron, stainless steel, ductile iron with EPDM encapsulation, Buna-N encapsulation, or _____.

C Operator: 10 position lever handle.

2.12 SWING CHECK VALVES

A Up To and Including 2 Inches:
1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.

B Over 2 Inches:
1. Iron body, bronze or _____ trim, stainless steel, bronze, bronze faced rotating, or _____ swing disc, renewable disc and seat, flanged, grooved, or _____ ends.

2.13 SPRING LOADED CHECK VALVES

A Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer, or threaded lug ends.

2.14 CLEANING AND CHEMICAL TREATMENT MATERIALS

A System Cleaner:
1. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodiumtripoly phosphate and sodium molybdate.

2. Biocide chlorine release agents such as sodium hypochlorite or calcium hypochlorite or microbiocides such as quarternary ammonia compounds, tributyltin oxide, methylene bis (thiocyanate).

B Closed System Treatment (Water):
1. Sequestering agent to reduce deposits and adjust pH; polyphosphate.
2. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.

PART 3 EXECUTION

3.1 PREPARATION

A Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C Remove scale and dirt on inside and outside before assembly.

D Prepare piping connections to equipment using jointing system specified.

E Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

F After completion, fill, clean, and treat systems. See Section 23 25 00 for additional requirements.

3.2 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Pressure test piping at a minimum pressure opf 150 psi for a minimum of 48 hours.

C Route piping in orderly manner, parallel to building structure, and maintain gradient.

D Install piping to conserve building space and to avoid interference with use of space.

E Group piping whenever practical at common elevations.

F Sleeve pipe passing through partitions, walls, and floors.

G Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified _____.

H Slope piping and arrange to drain at low points.

I Grooved Joints:
1. Install in accordance with the manufacturer's latest published installation instructions.

J Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.

K Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. See Section 23 07 19.

L Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00 .

M Install valves with stems upright or horizontal, not inverted.

3.3 SCHEDULES

A Pipe Application:
1. Chilled Water Piping, Interior or Exterior Above Ground:
a. Piping 2-inch and less: Copper pipe with brazed or press-fit joints or Steel pipe with screwed fittings.

b. Piping 2.5-inch and greater: Steel pipe with welded, flanged, or grooved fittings.

2. Hot Water Piping, Interior or Exterior Above Ground:
   a. Piping 2-inch and less: Copper pipe with brazed or press-fit joints or Steel pipe with screwed fittings.
   b. Piping 2.5-inch and greater: Steel pipe with welded, flanged, or grooved fittings.
3. Condenser Water Piping, Interior Above Grade:
   a. All pipe sizes: Steel pipe with welded fittings.
4. Condenser Water Piping, Exterior Above Ground:
   a. Piping 2-inch and less: Steel pipe with welded fittings, Sch 80 PVC with solvent fitting, or HDPE with heat fused joints.
   b. Piping 2.5-inch and greater: Steel pipe with welded fittings, Sch 80 PVC, or HDPE with heat fused joints.
5. Chilled Water, Exterior Below Ground:
   a. All Pipe Sizes: HDPE piping with heat fused joints.
6. Makeup-water Piping, Above Ground:
   a. Piping 2-inch and less: Copper pipe with brazed or press-fit joints or Steel pipe with screwed fittings.

B Hanger Spacing for Copper Tubing.
1. 1/2 Inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. 1 Inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-1/2 Inches and 2 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.

C Hanger Spacing for Steel Piping.
1. 1/2 Inch, 3/4 Inch, and 1 Inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. 1-1/4 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
3. 1-1/2 Inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. 2-1/2 Inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. 3 Inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. 4 Inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.
8. 6 Inches: Maximum span, 17 feet; minimum rod size, 1/2 inch.
9. 8 Inches: Maximum span, 19 feet; minimum rod size, 5/8 inch.
10. 10 Inches: Maximum span, 20 feet; minimum rod size, 3/4 inch.
11. 12 Inches: Maximum span, 23 feet; minimum rod size, 7/8 inch.

D Hanger Spacing for Plastic Piping.
1. 1/2 Inch: Maximum span, 42 inches; minimum rod size, 1/4 inch.
2. 3/4 Inch: Maximum span, 45 inches; minimum rod size, 1/4 inch.
3. 1 Inch: Maximum span, 51 inches; minimum rod size, 1/4 inch.
4. 1-1/4 Inches: Maximum span, 57 inches; minimum rod size, 3/8 inch.
5. 1-1/2 Inches: Maximum span, 63 inches; minimum rod size, 3/8 inch.
6. 2 Inches: Maximum span, 69 inches; minimum rod size, 3/8 inch.
7. 3 Inches: Maximum span, 7 feet; minimum rod size, 3/8 inch.
8. 4 Inches: Maximum span, 8 feet; minimum rod size, 1/2 inch.
9. 6 Inches: Maximum span, 10 feet; minimum rod size, 1/2 inch.
10. 8 Inches: Maximum span, 11 feet; minimum rod size, 5/8 inch.
11. 10 Inches: Maximum span, 13 feet; minimum rod size, 3/4 inch.
12. 12 Inches: Maximum span, 14 feet; minimum rod size, 7/8 inch.

3.4 CLEANING AND FLUSHING OF HYDRONIC PIPING SYSTEMS

A A representative of the manufacturer shall be present during critical periods of installation and testing, to verify that the installation is being made in accordance with the manufacturer's recommendations.
1. Cleaning of hydronic and chilled water piping systems:

2. General cleaning of piping systems. Purge pipe of construction debris and contamination before placing the systems in service. Provide and install temporary connections as required to clean, purge and circulate. Flush the chilled and hot water systems utilizing the filter feeders.
3. Install temporary strainers at the inlet of pumps and other equipment as necessary where permanent strainers are not indicated. Keep strainers in service until the equipment has been tested, then remove either entire strainer or straining element only. Fit strainers with a line size blow down ball valve and pipe to nearest drain. Blow down strainers, remove and clean as frequently as necessary.
4. Phase One: Initial flushing of system. Remove loose dirt, mill scale, weld heads, rust and other deleterious substances without damage to system components. Open valves, drains, vents and strainers at all system levels during flushing procedures. Flush until “potable water clear” and particles larger than 5 microns are removed.
5. Connect dead-end supply and return headers, even if not shown on the drawings, and provide terminal drains in bottom of pipe end caps or blind flanges.
6. Dispose of water in approved manner.
7. Phase Two: Cleaning of Piping Systems. Remove, without chemical or mechanical damage to any system component, adherent dirt (organic soil), oil, grease, (hydrocarbons), welding and soldering flux, mill varnish, piping components, rust (iron oxide) and other deleterious substances not removed by initial flushing. Chemical shall be approved by FBISD water treatment provide prepping compound. Insert anti-foam compound as necessary. Circulate for 48 hours or as recommended by the manufacturer. Dispose of water in approved manner. Flush system and replace with clean water. Verify compatibility of chemicals used with existing chemical treatment program on remodel projects.
8. Phase Three: Final flushing and rinsing until “potable water clear” and particles larger than 5 microns are removed. Operate valves to dislodge and debris in valve body. Dispose of water in approved manner.
9. Submit status report upon completion of each phase of work on each system.
10. Phase Four: Installation of chemicals to FBISD Standards.
11. Special requirements, if any, are specified in the sections on each type of piping or in the section on Water Treatment Systems.

B HVAC water treatment by project mechanical contractor. Contractor to provide shot feeders, flow indicators and taps for condenser water treatment system. Contractor to provide labor and chemical to clean and flush all piping system.

C The General Contractor is responsible to coordinate all flushing of piping to coincide with phasing of project.

D For any renovation projects, the General Contractor shall be responsible to provide a full building heavy flush where any HVAC components come in contact with building hot/chilled water loops.

E At all mezzanines with ladder access, provide overhead structural support for crane to be attached for maintenance use.

END OF SECTION

SECTION 23 21 23 - HYDRONIC PUMPS

PART 1 GENERAL

1.1 SECTION INCLUDES

A End-suction pumps.

1.2 RELATED REQUIREMENTS

A Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

B Section 23 09 34 - Variable-Frequency Motor Controllers for HVAC.

C Section 25 35 00 - Integrated Automation Instrumentation and Terminal Devices for HVAC.

1.3 REFERENCE STANDARDS

A NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

D Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

E

F Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Armstrong Fluid Technology, Inc: www.armstrongfluidtechnology.com/#sle.

B Aurora

C Bell & Gossett, a Xylem Inc. brand: www.bellgossett.com/#sle.

D Grundfos Pumps Corporation: www.grundfos.com/#sle.

E Taco Comfort Solutions:

F Substitutions: See Section 01 60 00 - Product Requirements.

2.2 GENERAL

A Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B Electrical Requirements:
1. Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.
2. Variable Frequency Drives (VFDs): Provide in accordance with Section 23 09 34, except for integral-VFDs.
3. Enclosures: Provide unspecified product(s) required to fit motor:

2.3 END-SUCTION PUMPS

A Split-Coupled Pump: Base-mounted, single-stage pump with horizontal shaft and radially- or horizontally-split casing rated for discharge pressures up to 175 psi.

B Casing: Cast iron or ductile iron with renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction, and discharge flanged connections with gauge ports.

C Impeller: Stainless steel, balanced, fully enclosed, keyed to shaft.

D Bearings: Oil lubricated roller or ball bearings.

E Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.

F Seal: Mechanical, 225 degrees F maximum continuous duty temperature.

G Drive: Flexible coupling with coupling guard.

H Baseplate: Cast iron or fabricated steel with integral drain rim.

I Electrical:
1. Motor: 1,750 rpm, open drip-proof (ODP); see Section 23 05 13.
2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 EXECUTION

3.1 PREPARATION

A Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Manufacturer shall certified field alignment after pump installation is complete.

C Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

D Provide line sized shut-off valve and strainer on pump suction, and line sized soft seat check valve and balancing valve on pump discharge.

E Provide air cock and drain connection on horizontal pump casings.

F Controls Human-Machine Interface (HMI): HVAC operator terminal; see Section 25 35 00.

END OF SECTION

SECTION 23 25 00 - HVAC WATER TREATMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A Materials.
1. System cleaner.
2. Closed system treatment (water).
3. Condenser water system treatment (cooling towers).

B Conductivity controller.

C Water meter.

D Solenoid valves.

E Side-stream filtration equipment.

1.2 RELATED REQUIREMENTS

A Section 01 60 00 - Product Requirements: Owner furnished treatment equipment.

1.3 REFERENCE STANDARDS

A UL (DIR) - Online Certifications Directory; Current Edition.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

C Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.

D Manufacturer's Installation Instructions: Indicate placement of equipment in systems, piping configuration, and connection requirements.

E Manufacturer's Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.

F Project Record Documents: Record actual locations of equipment and piping, including sampling points and location of chemical injectors.

G Operation and Maintenance Data: Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

H Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Nalco, an Ecolab Company; _____: www.nalco.com/#sle.

B Earthwise.

C Substitutions: See Section 01 60 00 - Product Requirements.

2.2 REGULATORY REQUIREMENTS

A Comply with applicable codes for addition of non-potable chemicals to building mechanical systems and to public sewage systems.

B Comply with UL (DIR) requirements.

C Perform work in accordance with local health department regulations.

2.3 EQUIPMENT

A Chemical Feed and Bleed-Off Controller:
1. Type: Solid state conductivity monitor with flow through electrode assembly, PTSA monitor, BACnet or Cellular connectivity. E-Report capable.
2. Visual readout of conductivity.
3. Relays: To operate chemical feed pumps and bleed-off valve.
4. Enclosure: NEMA 4X.
5. Flow Switch: Shuts down controller when tower pump stops.
6. Manufacturers: Lakewood, Prominent, Walchem, Megatron, or approved equal

B Bleed-Off Valve:
1. Type: Electric ball valve
2. Size: To match blowdown line.

C Solid Chemical Dissolving Units:
1. Acceptable Products: Hydro Systems Company Solid Dissolvers; Advantage Controls SFS Series, or approved equal

D Chemical Pump:
1. Manufacturer: Pulsatron, LMI, or equal.
2. Model: Series A Simplex chemical pump, variable output.
3. Mounting: Steel wall bracket.

E Corporation Stop Assemblies:
1. Manufacturer: Quantrol
2. Model: CS-075

F Make-Up and Blow Down Flow Meters:
1. Manufacturer: Carlon, Badger
2. Type: Turbine with electric contact head
3. Rating: As required
4. Sized to make up and blow down piping

G Chemical Feed Timer:
1. Type: Reset timer, o0-10 min. range minimum
2. Interlock with make-up flow meter to operate chemical feed pump.

H Corrosion Coupon Rack
1. Four station type:
   a. 2 low carbon steel
   b. 2 copper

2.4 CHEMICALS

A Scale and Corrosion Control
1. Product shall be a solid blend containing scale and corrosion inhibitors.
   a. Approved by local water pollution control authorities.
   b. Must contain PTSA tracer
2. Furnish chemicals for first year of operation beginning at Owner acceptance.
3. Furnish chemicals in container suitable for use as solution reservoirs.

B Algae and Biologics Control
1. Provide two separate algaecides for alternate use, (oxidizing and non-oxidizing).
   a. Furnish for first year of operation.
   b. EPA registered solid blend chemical biocide

C Test Equipment: Provide a metal test cabinet with lock and acid-resistant enamel finish, suitable for wall mounting. Cabinet shall be equipped with:
1. Titration test sets for determination of:
   a. Alkalinities
   b. Hardness
   c. Chlorine
2. Taylor comparator sets for the determination of phosphate and pH.
3. Drop type test sets for the determination of inhibitor levels in condenser cooling water and closed recirculating systems.
4. Triple-range conductivity meter.

2.5 MATERIALS

A System Cleaner:
1. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodiumtripoly phosphate and sodium molybdate.
2. Biocide chlorine release agents such as sodium hypochlorite or calcium hypochlorite or microbiocides such as quarternary ammonia compounds, tributyltin oxide, methylene bis (thiocyanate).

B Closed System Treatment (Water):
1. Sequestering agent to reduce deposits and adjust pH; polyphosphate.
2. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.

C Condenser Water System Treatment (Cooling Towers):
1. Manufacturers:
   a. Nalco, an Ecolab Company: www.nalco.com/#sle.
   b. Earthwise Environmental.

2.6 CONDUCTIVITY CONTROLLER

A Packaged monitor controller with solid state circuiting, five percent accuracy, linear dial adjustment, built-in calibration switch, on-off switch and light, control function light, output to control circuit and recorder.

2.7 WATER METER

A Displacement type cold water meter with sealed, tamper-proof magnetic drive, impulse contact register, single pole, double throw dry contact switch.

2.8 SOLENOID VALVES

A Forged brass body globe pattern, normally open or closed as required, explosion-proof and watertight solenoid enclosure, and continuous duty coil.

2.9 SIDE-STREAM FILTRATION SYSTEM

A System: Flow indicator, filter housing with cartridge filter, shut-off valves, and flow control valve.

B Hot Water and Glycol Filter Housing: Glass reinforced nylon plastic suitable for 220 degrees F and 200 psi operating conditions.

C Chilled Water Filter Housing: Reinforced polypropylene plastic housing suitable for 125 degrees F and 125 psi operating conditions.

D Cartridges: 30 micron for start-up and 5 micron for system operation.

PART 3 EXECUTION

3.1 FLUSHING & CLEANING OF CARBON STEEL PIPING SYSTEMS

A Overview

1. After the mechanical contractor has tested the piping, it is to be flushed and cleaned for service. Provide complete flush and cleaning of the closed loop chilled and hot water systems as specified herein. Systems must be commissioned as clean and meet water treatment specifications.
2. All chilled, and hot water piping and related equipment shall be thoroughly flushed with pre-cleaning chemicals designed to remove deposits such as pipe dope, oils, loose rust, mill scale, and other extraneous materials. Recommended dosages of pre-cleaner chemical products shall be furnished by water treatment supplier, added, and circulated throughout the water systems. The water system shall then be diluted and rinsed thoroughly until no foreign matter is observed and total alkalinity of the water is equal to or better that that of the make-up water.
3. All temporary connections required for flushing, cleaning, purging, and circulating shall be included. Provide suitable pipe bypasses at each coil and heat exchanger during the flushing and cleaning operation.
4. Flushing equipment will include a pump(s) and inline filtration, that will meet or exceed the volume required to flush and purge the system at the required velocity rate through the largest pipe. Pump curves will be submitted along with other important documentation for the related equipment on the unit. This will include, at minimum, filtration type, flow meter(s), pressure gauges, and unit description or picture. All operators will comply with all safety regulations of the project site. The flushing operation will be manned continuously during the flushing process.

B Flushing Procedure

1. Pre-Flush – Bypass loops should be installed in front of any strainers and control valves at all equipment components when possible. Coordinate with PurgeRite for proper sizing and placement of bypasses and flush ports.
    a. Bypass or install temporary strainer elements in front of pumps, tanks, solenoid valves, control valves, and other equipment where permanent strainers are not indicated that are not bypassed. Keep these strainers in service until the equipment has been tested, then remove either the entire strainer or straining element only. Fit strainers with a line size blow-off valve. Strainers should be removed when external flush pumps are used in conjunction with filtration.
    b. Flush ports should be identified along with the type of high-pressure or other hose/piping that will be used to connect to the system. The water source should be identified and must be adequate to fill and make up water in a timely manner to the system during the flush process. A water dump location should be identified as well, which is usually a sanitary sewer.
2. Clear Water Flush – Fill the piping system with clean potable water. The first flush is a clear water flush intended to circulate water through the system and force loose debris to low point drains and filtration system. This flush should be at minimum of 5 ft./sec. throughout. Filtration should be 50 microns at minimum. This flush shall continue until the system water is comparable to the make-up water. Iron content should be under 2.0 ppm.
3. Cleaning & Passivation – The second flush cycle is a combined flushing cycle where cleaning and passivation chemicals are introduced into the system to clean the oils and treat the inside wall of the piping system. This process will be monitored by the chemical treatment company to meet the chemical specifications of the water. The cleaning velocity should be between 3-5 ft./sec. throughout. The circulation duration will be based on the chemical testing—24 hours at minimum.

4. Final Rinse – The system will be continuously flushed while discharging chemicals into the approved sanitary system. As the existing treated water is being discharged, a freshwater make-up source will be utilized to ensure air is not introduced into the system. Continue to drain the system while adding domestic water to dilute the treated water. The chemical treatment company will monitor the outgoing water composition and compare the composition with the incoming water. Flush with fresh water until the conductivity is reduced to that of the make-up water and iron meets specifications. The final system water should be approved by the chemical treatment company. Filtration should be 5 microns at minimum.
5. Final Chemical Fill – Once the chemical treatment company has determined the system has been brought back to the correct composition, the chemical treatment company will inject the final chemicals into the system. Once the system is filled with the final chemicals it is important the water is not left stagnant.
    a. Verify satisfactory completion of clean piping and a final flushing and chemical treatment report should be submitted by field personnel. The report should include at minimum, project name, date, location, parties involved, type of pipes treated, scope summary, flows, durations, and other relevant information.
    b. Cleaning chemicals, procedure, water testing, reporting, and consultation must be provided by a qualified water treatment company specializing in this type of work.

3.2 INSTALLATION

A Install in accordance with manufacturer's instructions.

3.3 CLOSED SYSTEM TREATMENT

A Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around balancing valve downstream of circulating pumps unless indicated otherwise.

B Introduce closed system treatment through bypass feeder when required or indicated by test.

C Provide 3/4 inch water coupon rack around circulating pumps with space for 4 test specimens.

3.4 CONDENSER WATER SYSTEMS (COOLING TOWERS)

A Provide automatic condenser water control systems for inhibitor feed, blowdown and biocide feeds. Inhibitor application shall be meter activated, blowdown shall be conductivity activated, and biocide shall be meter fed with blowdown locked out to ensure biocide retention time.

B Control system shall incorporate solid state integrated circuits and digital LED displays, in NEMA-12 steel enclosure. Provide gasketed and lockable door.

C Base dissolved solids control on conductivity and include:
1. LED digital readout display (micro-ohm/cm).
2. Temperature compensated sensor probe adaptable to sample stream manifold.
3. High, low, normal conductance indicator lights (LED).
4. High or low conductance alarm light (flash or steady switch), trip points field adjustable. Flash or steady switch shall have silence position.
5. Illuminated legend shall indicate "ALARM" whenever alarm condition exists.
6. Hand-off-automatic switch for solenoid bleed valve.
7. Illuminated legend shall indicate "BLEED" when valve is operated.

D Base inhibitor feed control on make-up volume and include:
1. Solid state counter (1-15 field selectable).
2. Solid state timer (adjustable 1/4 to 5 minutes).
3. Test switch.
4. Hand-off-automatic switch for chemical pump.
5. Illuminated legend shall indicate "FEED" when pump is activated.

6. Solid state lock-out timer (adjustable 1/4 to 3 hours) and indicator light. Lock-out timer shall deactivate the pump and activate alarm circuits.
7. Panel totalizer (amount of makeup), electro-mechanical type.

E Biocide programmer to include:
1. 24 hour timer with 14 day skip feature to permit activation any hour of the day.
2. Precision solid state bleed lock-out timer (0-9 hours) and biocide pump timer (0 - 2-1/4 hours), clock controlled.
3. Solid state alternator to enable the use of two different formulations.
4. Digital display of the time of day (24 hours).
5. LED display of day of week (14 days).
6. Battery back-up so clock is not disturbed by power outages, quartz timekeeping accuracy.
7. Hand-off-automatic switches for biocide pumps.
8. Illuminated legend shall indicate "BIOCIDE A" or "BIOCIDE B" when pump is activated.

F Provide water meter on system make-up, wired to control system.

G Provide solution pumps to feed sequestering agent and corrosion inhibitor from solution tank into condenser water supply to tower. Provide agitator as required.

H Provide conductivity controller to sample condenser water and operate 1 inch solenoid bleed valve and piping to blowdown controller sampler wired to open when condensing water pump is operating.

I Introduce biocide to tower by intermittent slug feed.

J Provide liquid level switch in each solution tank to deactivate solution pump and agitator and sound local alarm bell.

K Provide 3/4 inch water coupon rack around circulating pumps with space for 4 test specimens.

3.5 CLOSEOUT ACTIVITIES

A Training: Train Owner's personnel on operation and maintenance of chemical treatment system.
1. Provide minimum of two hours of instruction for two people.
2. Have operation and maintenance data prepared and available for review during training.
3. Conduct training using actual equipment after treated system has been put into full operation.

3.6 MAINTENANCE

A Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the equipment manufacturer or original installer.

B Provide service and maintenance of treatment systems for one year from Date of Substantial Completion.

C Provide monthly technical service visits to perform field inspections and make water analysis on-site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.

D Provide laboratory and technical assistance services during this maintenance period.

E Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based upon these inspections.

END OF SECTION

SECTION 23 31 00 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Metal ducts.

B Flexible ducts.

C Air plenums and casings.

D Ducts for kitchen exhaust applications.

E Ducts for laboratory and industrial-grade applications.

1.2 RELATED REQUIREMENTS

A Section 07 84 00 - Firestopping.

B Section 11 40 00 - Foodservice Equipment: Kitchen range hoods.

C Section 23 07 13 - Duct Insulation: External insulation and duct liner.

D Section 23 33 00 - Air Duct Accessories.

E Section 23 33 19 - Duct Silencers.

F Section 23 36 00 - Air Terminal Units.

G Section 23 37 00 - Air Outlets and Inlets: Fabric air distribution devices.

1.3 REFERENCE STANDARDS

A ANSI Z9.5 - Laboratory Ventilation; 2022.

B ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

F NFPA 45 - Standard on Fire Protection for Laboratories Using Chemicals; 2019.

G NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

H NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

I NFPA 91 - Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids; 2020.

J NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

K SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

L SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

M SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.

N UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

O UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

P UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

Q UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide data for duct materials.

C Shop Drawings: Indicate duct fitting types, gauges, sizes, welds, and configuration.

D Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate per appropriate seal class, following SMACNA (LEAK).

E Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.5 FIELD CONDITIONS

A Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B Maintain temperatures within acceptable range during and after installation of duct sealants.

1.6 WARRANTY

A See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B Provide metal duct unless otherwise indicated.

C Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 23 33 19.

D Duct Shape and Material in accordance with Allowed Static Pressure Range: Refer to Part 3 Duct Pressure and Leakage Class Schedule

E Duct Sealing and Leakage in accordance with Static Pressure Class: Refer to Part 3 Duct Pressure and Leakage Class Schedule

F Duct Fabrication Requirements:

1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.2 METAL DUCTS

A. Material Requirements:
1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Flat-Oval Metal Ducts:
1. Flat-Oval Single Wall Duct: Machine made from a round spiral lock seam duct.
   a. Fittings: Manufacture at least two gauges heavier metal than the duct.
   b. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
2. Flat-Oval Double Wall Insulated Duct: Machine made from round spiral lock seam duct.
   a. Fittings: Manufacture with solid inner wall.
   b. Inner Wall: Perforated galvanized steel.
   c. Insulation:
      1) Thickness: 1 inch fiberglass.

C. Round Metal Ducts:
1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
2. Round Double Wall Insulated Duct: Round spiral lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with the solid inner wall.
   a. Insulation:
      1) Thickness: 1 inch.
      2) Material: Air.
3. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

D. Round Spiral Duct:
1. Round spiral lock seam duct with galvanized steel outer wall.

E. Connectors, Fittings, Sealants, and Miscellaneous:
1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   b. VOC Content: Not more than 250 g/L, excluding water.
   c. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
4. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.3 FLEXIBLE DUCTS

A. Flexible Air Ducts:
1. UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound spring steel wire.
2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
3. Pressure Rating: From 10 in-wc positive to 1 in-wc negative.
4. Maximum Velocity: 4,000 fpm.

5. Temperature Range: Minus 20 to 210 degrees F.

B Vapor Barrier Insulated Flexible Air Ducts:
1. UL 181, Class 1, two-ply polyester or vinyl film supported by helically wound spring steel wire.
2. Pressure Rating: From 10 in-wc positive to 1 in-wc negative.
3. Temperature Range: Minus 10 to 160 degrees F.

C Uninsulated Flexible Air Ducts:
1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
2. Pressure Rating: From 10 in-wc to 1 in-wc negative.
3. Temperature Range: Minus 20 to 210 degrees F.

2.4 AIR PLENUMS AND CASINGS

A Fabricate in accordance with SMACNA (DCS) for indicated operating pressures indicated.

B Minimum Fabrication Requirements:
1. Fabricate acoustic plenum or casing with reinforcing turned inward.
2. Provide 16-gauge, 0.059-inch sheet steel back facing and 22-gauge, 0.029-inch perforated sheet steel front facing with 3/32 inch diameter holes on 5/32 inch centers.
3. Construct panels 3 inches thick, packed with 4.5 pcf minimum glass fiber insulation media, on inverted channel of 16-gauge, 0.059-inch sheet steel.
4. Mount floor-mounted plenum or casings on 4-inch high concrete curbs. At floor, rivet panels on 8-inch centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18-gauge, 0.052-inch expanded metal mesh supported at 12-inch centers, turned up 12 inches at sides with sheet metal shields.

C Access Doors:
1. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
2. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.
3. Provide clear wire glass observation ports, minimum 6 by 6 inch size.

2.5 DUCTS FOR KITCHEN EXHAUST APPLICATIONS

A Provide ductwork, fittings, and appurtenances in accordance with NFPA 96, SMACNA (KVS), UL 1978, and UL 2221 requirements and guidelines.

B Class 1 duct for air with gas and grease particle exhaust at an air velocity of 1,500 to 2,500 fpm.

C Where ducts are not self-draining back to equipment, provide low-point drain pocket with the copper drain pipe to a sanitary sewer.

D Design, fabricate, and install liquidtight preventing exhaust leakage into building.

E Dishwasher Exhaust Duct:
1. Duct Size: 1 in-wc pressure class stainless steel or Aluminum.
2. Fabricate using single wall, 20-gauge, 0.035-inch Type 304 stainless steel with external welded joints.
3. Seal joints during installation with factory-supplied overlapping V-bands and sealant.

F Kitchen Hood and Grease Exhaust Duct:
1. Fabricate in accordance with ductwork manufacturer's instructions, SMACNA (DCS), SMACNA (KVS), and NFPA 96.
2. Rectangular, Single-Wall, Premanufactured Grease Exhaust Duct:
   a. UL Listed and labeled to UL 1978.
   b. Construct of 16-gauge, 0.059-inch sheet steel using continuous external welded joints in rectangular sections.

3. Zero Clearance, 2-Hour Fire-Rated, Round, Double-Wall, Premanufactured Grease Duct:
   a. UL Listed and labeled to UL 1978 and UL 2221.
   b. Nominal 3 inches thick, high density body soluble fiber insulation between 20-gauge, 0.035-inch Type 304 stainless steel liner, and 24-gauge, 0.0239-inch aluminized steel sheet outer jacket.
   c. Seal joints during installation with factory-supplied overlapping V-bands and sealant.
   d. Through-penetration firestop listed to UL 1479 or ASTM E814.
   e. Minimum horizontal slope of 1/16 inch per foot per manufacturers listing to UL 1978.
4. Grease Exhaust Duct Access Doors:
   a. Listed when tested in accordance with UL 1978.
   b. Install hinged access doors where indicated or required for access for cleaning and inspection of duct.
   c. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.

2.6 DUCTS FOR LABORATORY AND INDUSTRIAL-GRADE APPLICATIONS

A Sectional Shape and Material Requirements:

B Laboratory Exhaust Applications:
1. Fume Hood Cabinet Exhaust:
   a. Provide ductwork and appurtenances in accordance with NFPA 91 requirements except where NFPA 45 applications take precedence.
   b. Coordinate duct, fittings, hangers, and accessories to comply with ANSI Z9.5.
   c. Design, fabricate, and install liquidtight preventing exhaust leakage into the building.

PART 3 EXECUTION

3.1 INSTALLATION

A Install, support, and seal ducts in accordance with SMACNA (DCS).

B Install products following the manufacturer's instructions.

C Comply with safety standards NFPA 90A and NFPA 90B.

D During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

E Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

F Kitchen Range Hoods: Install when provided by Section 11 40 00 then fit-out with respective ductwork and accessories to interconnect exhaust system.

G Kitchen Hood Exhaust: Provide residue traps at the base of vertical risers with provisions for the cleanout.

H Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.

I Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

J Use double nuts and lock washers on threaded rod supports.

K At exterior wall louvers, seal duct to louver frame and install blank-out panels.

L Louver Fit-out:
1. Provide blank-out panels sealing available area of wall-mounted exterior-faced louver when connected ductwork is smaller than actual louver free area, and duct outlet is smaller than the louver frame.
2. Use the same duct material painted black on the exterior side, then seal louver frame and duct.

M Fire Partitions: Provide firestopping sealing. See Section 07 84 00.

N Duct Accessories, Terminal Units, Inlets, and Outlets: Interconnect as indicated in Sections 23 33 00, 23 36 00, and 23 37 00.

O Duct Insulation: Provide duct insulation. See Section 23 07 13.

3.2 DUCT PRESSURE AND LEAKAGE CLASS SCHEDULE

A Ducts connected to Fan-coil units, furnaces, heat pumps, and terminal boxes:
1. Pressure Class: 1-inch wg.
2. Minimum SMACNA Seal Class: C.
3. SMACNA Leakage Class for Rectangular: 16.
4. SMACNA Leakage Class for Round and Flat Oval: 8.
5. Minimum gauge thickness for Rectangular: 24 gauge.
6. Duct Leakage and Pressure Test Required: No.

B Ducts connected to single zone air-handling units, (AHU's that do not have terminal boxes for temperature control):
1. Pressure Class: Positive 3-inch wg.
2. Minimum SMACNA Seal Class: B.
3. SMACNA Leakage Class for Rectangular: 8.
4. SMACNA Leakage Class for Round and Flat Oval: 4.
5. Minimum gauge thickness for Rectangular: 24 gauge.
6. Duct Leakage and Pressure Test Required: No.

C Ducts connected to air-handling units that use terminal boxes to control airflow and temperature:
1. Pressure Class Supply Ducts: 6-inch wg.
    a. Minimum SMACNA Seal Class: A.
    b. SMACNA Leakage Class for Round and Flat Oval: 2.
    c. Rectangular duct is not allowed.
    d. Duct Leakage and Pressure Test Required: Yes.
2. Pressure Class Return and/or Exhaust Ducts: 3-inch wg.
    a. Minimum SMACNA Seal Class: B
    b. SMACNA Leakage Class for Rectangular: 8
    c. SMACNA Leakage Class for Round and Flat Oval: 4
    d. Minimum gauge thickness for Rectangular: 24 gauge.
    e. Duct Leakage and Pressure Test Required: No.

D Ducts connect to light commercial RTU's and ERU's:
1. Pressure Class Supply, Return and/or Exhaust: 1-inch wg.
2. Minimum SMACNA Seal Class: C.
3. SMACNA Leakage Class for Rectangular: 16.
4. SMACNA Leakage Class for Round and Flat Oval: 16.
5. Minimum gauge thickness for Rectangular: 24 gauge.
6. Duct Leakage and Pressure Test Required: No.

E Ducts connected to Exhaust Fans selected at less than 1.0" TSP:
1. Pressure Class: Negative 1-inch wg.
2. Minimum SMACNA Seal Class: C.
3. SMACNA Leakage Class for Rectangular: 16.
4. SMACNA Leakage Class for Round: 8.
5. Minimum gauge thickness for Rectangular: 24 gauge.
6. Duct Leakage and Pressure Test Required: No.

F Ducts connected to Exhaust Fans selected greater than 1.0" TSP:
1. Pressure Class: Negative 3-inch wg.
2. Minimum SMACNA Seal Class: B.

3. SMACNA Leakage Class for Rectangular: 8.
4. SMACNA Leakage Class for Round: 4.
5. Minimum gauge thickness for Rectangular: 24 gauge.
6. Duct Leakage and Pressure Test Required: No.

G Ducts connected to Commercial Kitchen Hoods: Comply with NFPA 96.
1. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
2. Concealed: Carbon-steel sheet.
3. Welded seams and joints.
4. Pressure Class: Positive or negative 3-inch wg.
5. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
6. SMACNA Leakage Class: 4.
7. Duct Leakage and Pressure Test Required: No.

H Ducts connected to Dishwasher Exhaust Systems:
1. Type 304, stainless-steel sheet.
2. Exposed to View: No. 4 finish.
3. Concealed: No. 2D finish.
4. Welded seams and flanged joints with watertight EPDM gaskets.
5. Pressure Class: Positive or negative 2-inch wg.
6. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
7. SMACNA Leakage Class for Rectangular: 16
8. SMACNA Leakage Class for Round: 6.
9. Duct Leakage and Pressure Test Required: No.

I Ducts connected to Fume Hoods:
1. Type 316, stainless-steel sheet.
   a. Exposed to View: No. 4 finish.
   b. Concealed: No. 2B finish.
2. Pressure Class: Positive or negative 4-inch wg.
3. Minimum SMACNA Seal Class: A.
4. SMACNA Leakage Class: 2.
5. Duct Leakage and Pressure Test Required: No.

3.3 DUCT LEAKAGE & PRESSURE TESTING

A Where required by the Duct Pressure and Leakage Class Schedule, duct system shall be tested in accordance with the following requirements.
1. Test complete system at a minimum of 6.0" WC or the listed pressure class, which ever is greater. The maximum allowable leakage for the system shall be 1% of the total design airflow.
2. The mechanical contractor shall perform the duct leakage test and shall provide equipment necessary for performing the test including a certified orifice section and calibration paperwork. All test readings shall be converted to CFM leakage according to the certified orifice's calibration paperwork, and the TAB contractor shall calculate the resulting leakage percentage to determine whether the system passes or fails.
3. The ductwork shall be tested from source (supply fan) all the way to the connected devices (just upstream of VAV, FVAV, etc…). All duct taps, runouts, fire dampers, fire smoke dampers, etc… included in this run shall be installed at the time of the test, and the test shall run through these items.
4. Where large duct systems are tested in sections, the entirety of the system will not be considered passing until all portions are tested, the results are summed, and the total leakage of the entire system is calculated and determined to be passing.
5. All pressure tests shall be witnessed by the owner's representative, design team, and test and balancing (TAB) firm. If the design team and owner's representative cannot be present for the testing, the TAB firm must be present and pictures of ducts being tested, devices being used for testing, pictures of the orifice and its associated calibration paperwork must be taken.

6. Submit results of duct pressure tests along with confirmation of passing to the engineer of record, owner, and commissioning agent.

END OF SECTION

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A Combination fire and smoke dampers.

B Duct access doors.

C Duct test holes.

D Fire dampers.

E Flexible duct connectors.

F Smoke dampers.

G Volume control dampers.

H Low leakage (Class 1A) control dampers.

1.2 RELATED REQUIREMENTS

A Section 23 31 00 - HVAC Ducts and Casings.

1.3 REFERENCE STANDARDS

A NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

B NFPA 92 - Standard for Smoke Control Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

D UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

E UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

F UL 555C - Standard for Safety Ceiling Dampers; Current Edition, Including All Revisions.

G UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

C Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.

D Manufacturer's Installation Instructions: Provide instructions for fire dampers.

1.5 DELIVERY, STORAGE, AND HANDLING

A Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1 COMBINATION FIRE AND SMOKE DAMPERS

A Manufacturers:
1. Arrow United Industries, www.arrowunited.com.
2. Greenheck, www.greenheck.com.

3. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com/#sle.
4. Nailor Industries, Inc: www.nailor.com/#sle.
5. Pottorff: www.pottorff.com/#sle.
6. Ruskin Company: www.ruskin.com/#sle.
7. United Enertech: www.unitedenertech.com/#sle.
8. Substitutions: See Section 01 60 00 - Product Requirements.

B Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

C Ratings:
1. Fire Resistance: Damper shall match wall ratings (1.5-hrs or 3-hrs), refer to architectural plans for wall ratings.
2. Fire Closure Temperature: 165 degree F.Each combination fire-smoke damper shall be equipped with a factory installed heat responsive device rated to close the damper when the temperature at the damper reaches 165 degree F.
3. Elevated Operational Temperature: Dampers shall have a UL 555S elevated temperature rating of 250°F.

D Construction:
1. Frame: Damper frame shall be 16 ga. galvanized steel formed into a 5 in. x 1 in. structural hat channel. Dampers less than 17 in. high shall utilize low profile geometry and 20 ga. galvanized steel for the top and bottom frame members to maximize free area. Frame shall be 4-piece construction with 1 ½ in. (minimum) integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking. No welding of damper frames shall be permitted.
2. Seals:
   a. Blade Edge: Blade seals shall be extruded silicone rubber mechanically secured to the appropriate blade edges
   b. Jamb: Flexible stainless steel compression type.
3. Linkage: Blade linkages shall be non-adjustable and concealed within the jamb of the damper.
4. Axles: Minimum ½ inch dia. zinc plated steel.
5. Sleeves: Damper shall be supplied as a single assembly with a factory installed sleeve made of material matching that of the damper.
6. Fire Closure Device: Reusable Resettable Link.Mounting: Horizontal or Vertical, refer to plans for requirements.
7. Finish: Galvanized steel.
8. Actuators:
   a. Electric, 120V, 2-position.
   b. Mounting Location: External (outside of duct).
9. Retaining Angles: 1 ½” x 1 ¼” or 2 ½” x 1 ½”.

E Differential Pressure: Dampers shall have a UL 555S differential pressure rating of 4 in. wg.

F Requirements for Fire and Smoke Dampers installed in Medium Pressure Systems:
1. Performance:
   a. Pressure Drop: The Damper manufacturer's submittal data shall certify that all pressure drop data is licensed in accordance with the AMCA Certified Ratings Program for Test Figures 5.2, 5.3, and 5.5. Damper air performance data shall be developed in accordance with the latest edition of AMCA Standard 500-D. Dampers shall be labeled with the AMCA Air Performance Seal. AMCA certified pressure drop for a 24 in. wide x 24 in. high damper shall not exceed 0.06 in. wg when subjected to an airflow velocity of 1500 fpm according to AMCA Test Figure 5.3.
   b. Leakage: Dampers shall have a UL555S leakage rating of Leakage Class I. (8 cfm/ft2 (0.04 m3/ s/m2) at 4 in. wg (1.0 kPa).

2. Blades: Damper blades shall be of 14 ga. equivalent, galvanized steel with full length structural reinforcement and a double skin true airfoil shape. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to completely fill the damper opening.
3. Velocity: Dampers shall have a UL 555S velocity rating of 4000 fpm.

G Requirements for Fire and Smoke Dampers installed in Low Velocity Systems:
1. Performance:
   a. Pressure Drop: The damper manufacturer's submittal data shall certify that all pressure drop data is licensed in accordance with the AMCA Certified Ratings Program for Test Figures 5.2, 5.3, and 5.5. Damper air performance data shall be developed in accordance with the latest edition of AMCA Standard 500-D. Dampers shall be labeled with the AMCA Air Performance Seal. AMCA certified pressure drop for a 24 in. wide x 24 in. high damper shall not exceed 0.09 in. wg when subjected to an airflow velocity of 1500 fpm according to AMCA Test Figure 5.3.
   b. Leakage: Dampers shall have a UL555S leakage rating of Leakage Class II. (20 cfm/ft2 at 4 in. wg).
2. Blades: Damper blades shall be 16 ga. galvanized steel strengthened by three longitudinal 1 in. deep V-grooves running the entire length of each blade. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to completely fill the damper opening.
3. Velocity: Dampers shall have a UL 555S velocity rating of 2000 fpm.

2.2 DUCT ACCESS DOORS

A Fabricate in accordance with SMACNA (DCS) and as indicated.

B Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick-fastening locking devices. For insulated ducts, install minimum 1-inch thick insulation with sheet metal cover.
1. Less Than 12 inches Square: Secure with sash locks.
2. Up to 18 inches Square: Provide two hinges and two sash locks.
3. Larger Sizes: Provide an additional hinge.

C Access doors with sheet metal screw fasteners are not acceptable.

2.3 DUCT TEST HOLES

A Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.4 FIRE DAMPERS

A Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

B Ceiling (Radiation) Dampers: Galvanized steel, 22-gauge, 0.0299-inch frame and 16-gauge, 0.0598-inch flap, two layers of 0.125-inch thick ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
1. Boot Fitting: Factory-provided el type (90 degree). Include field-provided collar.
2. Rated for one hour service in compliance with UL 555C.

C Horizontal Dampers: Galvanized steel, 22-gauge, 0.0299-inch frame, stainless steel closure spring, and lightweight, heat-retardant, non-asbestos fabric blanket.

D Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1-inch pressure-class ducts up to 12 inches in height.

E Multiple Blade Dampers: 16-gauge, 0.0598-inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

F Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.5 FLEXIBLE DUCT CONNECTORS

A Fabricate in accordance with SMACNA (DCS) and as indicated.

B Flexible Duct Connections: Fabric crimped into metal edging strip.

2.6 SMOKE DAMPERS

A Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.

B Dampers: UL Class 1 airfoil blade type smoke damper, normally open automatically operated by electric actuator.

C Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.7 VOLUME CONTROL DAMPERS

A Fabricate in accordance with SMACNA (DCS) and as indicated.

B Single Blade Dampers:
1. Fabricate for duct sizes up to 6 by 30 inch.
2. Blade: 24 gauge, 0.0239 inch, minimum.

C Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches. Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.
1. Blade: 18 gauge, 0.0478 inch, minimum.

D End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

E Quadrants:
1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. Where rod lengths exceed 30 inches provide regulator at both ends.

2.8 LOW LEAKAGE (CLASS 1A) CONTROL DAMPERS

A Manufacturers:
1. Ruskin Company; CD50: www.ruskin.com/#sle.
2. United Enertech; _____: www.unitedenertech.com/#sle.
3. Greenheck, www.greenheck.com.

B Maximum Leakage Allowed: 3 cfm/sq ft at 1 in-wc.

C Frame:
1. Material: 20-gauge galvanized steel.

D Blade:
1. Type: Multi-blade extruded airfoil for high pressure.
2. Operation: Opposed type.

E Other Requirements:
1. Paint Finish: Standard.
2. Sleeve or Flange: Factory-mounted standard.

PART 3 EXECUTION

3.1 INSTALLATION

A Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 31 00 for duct construction and pressure class.

B Provide duct test holes where indicated and required for testing and balancing purposes.

C Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire-rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

D Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.

E Demonstrate re-setting of fire dampers to Owner's representative.

F At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

G Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.

H Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 23 34 23 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Roof exhausters.

B Cabinet exhaust fans.

C Upblast roof exhausters.

D Inline centrifugal fans and blowers.

E Kitchen hood upblast roof exhausters.

F Utility vent blower sets.

G Laboratory-fume exhaust fans.

1.2 RELATED REQUIREMENTS

A Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

B AMCA 99 - Standards Handbook; 2016.

C AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.

D AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.

E AMCA 211 - Certified Ratings Program Product Rating Manual for Fan Air Performance; 2022, with Editorial Revision (2023).

F AMCA 260 - Laboratory Methods of Testing Induced Flow Fans for Rating; 2020.

G AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

H AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

I AMCA 311 - Certified Ratings Program Product Rating Manual for Fan Sound Performance; 2016.

J ANSI Z9.5 - Laboratory Ventilation; 2022.

K NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

L NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

M UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C Manufacturer's Instructions: Indicate installation instructions.

1.5 FIELD CONDITIONS

A Permanent ventilators may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Carnes, a division of Carnes Company Inc: www.carnes.com/#sle.

B Greenheck Fan Corporation: www.greenheck.com/#sle.

C Loren Cook Company: www.lorencook.com/#sle.

D PennBarry, Division of Air System Components: www.pennbarry.com/#sle.

E Twin City Fan & Blower: www.tcf.com/#sle.

2.2 POWER VENTILATORS - GENERAL

A Static and Dynamically Balanced: Comply with AMCA 204.

B Performance Ratings: Comply with AMCA 210, bearing certified rating seal.

C Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.

D Fabrication: Comply with AMCA 99.

E Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

F Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

2.3 ROOF EXHAUSTERS

A Fan Unit: Direct driven unless otherwise noted, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

B Fan Motor:
1. ECM (Electrically Commutated Motor): Brushless DC controlled by an integrated controller/inverter that operates the wound stator and senses rotor position to electrically commutate the stator. Motor shall be provided with manual speed controller and shall also accept a 0-10V speed signal for speed control from BAS contractor.

C Roof Curb: 8 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.

D Disconnect Switch: Factory wired, nonfusible, in housing for thermal overload protected motor.

E Backdraft Damper: Aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

F Sheaves: When required, cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm gets attained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

G Performance Ratings: As indicated on drawings.

2.4 CABINET EXHAUST FANS

A Centrifugal Fan Unit: Direct driven with galvanized steel housing lined with acoustic insulation, resiliently mounted motor, gravity backdraft damper in discharge.

B Grille: Molded white plastic.

C Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is reached with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

D Performance Ratings: As indicated on drawings.

2.5 UPBLAST ROOF EXHAUSTERS

A Belt Drive Fan:
1. Fan Wheel:
   a. Type: Non-overloading, backward inclined centrifugal.
   b. Material: Aluminum, statically and dynamically balanced.
2. Housing:
   a. Construct of heavy gauge aluminum including curb cap, windband, and motor compartment.
   b. Rigid internal support structure.
   c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
   d. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.
   e. Provide breather tube for fresh air motor cooling and wiring.

B Shafts and Bearings:
1. Fan Shaft:
   a. Ground and polished steel with anti-corrosive coating.
   b. First critical speed at least 25 percent over maximum cataloged operating speed.
2. Bearings:
   a. Permanently sealed or pillow block type.
   b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
   c. 100 percent factory tested.

C Drive Assembly:
1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
2. Belts: Static free and oil resistant.
3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
4. Motor pulley adjustable for final system balancing.
5. Readily accessible for maintenance.

D Disconnect Switches:
1. Factory mounted and wired.
2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
3. Finish for Painted Steel Enclosures: Provide manufacturer's standard or factory-applied gray unless otherwise indicated.
4. Positive electrical shutoff.
5. Wired from fan motor to junction box installed within motor compartment.

E Roof Curb: 8 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, curb bottom, ventilated double wall, and factory installed nailer strip.

F Drain Trough: Allows for single-point drainage of water, grease, and other residues.

G Options/Accessories:
1. Dampers: Provide motorized type.
2. Grease Trap: Required on Kitchen Exhaust fans only.
   a. Container system to collect grease residue.
3. Hinge Kit: Required on Kitchen Exhaust fans only.
   a. Allows fan to tilt away for access to wheel and ductwork for inspection and cleaning.

4. Tie-down Points: Four brackets located on windband secures fan in heavy wind applications.

H Performance Ratings: As indicated on drawings.

2.6 INLINE CENTRIFUGAL FANS AND BLOWERS

A Centrifugal Fan Unit: V-belt or direct driven, with galvanized steel housing lined with acoustic insulation, resiliently-mounted motor, gravity backdraft damper in discharge.

B Backward Inclined Blower:
1. Direct-driven, resiliently mounted motor, heavy-duty ball bearings, powder-coated steel housing for outdoor service, and removable service panels.
2. Accessories: Provide external vibration isolator spring.

C Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm gets reached with sheaves set at mid-position; fan shaft with self-aligning prelubricated ball bearings.

D Performance Ratings: As indicated on drawings.

2.7 KITCHEN HOOD UPBLAST ROOF EXHAUSTERS

A Direct Drive Fan:
1. Fan Wheel:
   a. Type: Non-overloading, backward inclined centrifugal.
   b. Material: Aluminum, statically and dynamically balanced.
2. Housing:
   a. Construct of heavy gauge aluminum including curb cap, windband, and motor compartment.
   b. Rigid internal support structure.
   c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
   d. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.
   e. Provide breather tube for fresh air motor cooling and wiring.

B Shafts and Bearings:
1. Fan Shaft:
   a. Ground and polished steel with anti-corrosive coating.
   b. First critical speed at least 25 percent over maximum cataloged operating speed.
2. Bearings:
   a. Permanently sealed or pillow block type.
   b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
   c. 100 percent factory tested.

C Drive Assembly:
1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
2. Belts: Static free and oil resistant.
3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
4. Motor pulley adjustable for final system balancing.
5. Readily accessible for maintenance.

D Disconnect Switches:
1. Factory mounted and wired in NEMA 3R Encloseure.
2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
3. Finish for Painted Steel Enclosures: Provide manufacturer's standard or factory-applied gray unless otherwise indicated.
4. Positive electrical shutoff.
5. Wired from fan motor to junction box installed within motor compartment.

E Roof Curb: 8 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, curb bottom, ventilated double wall, and factory installed nailer strip.

F Drain Trough: Allows for single-point drainage of water, grease, and other residues.

G Options/Accessories:
1. Birdscreen:
2. Roof Curb Extension: Vented curb extension where required for compliance with minimum clearances required by NFPA 96.
3. Grease Trap:
   a. Container system to collect grease residue.
   b. Maintain 40" height from roof surface to discharge of fan.
4. Hinge Kit:
   a. Hinges and restraint cables mounted to base sleeve.
5. Tie-down Points: Four brackets located on windband secures fan in heavy wind applications.

H Performance Ratings: As indicated on drawings.

2.8 UTILITY VENT BLOWER SETS

A Manufacturers:
1. Greenheck Fan Corporation: www.greenheck.com/#sle.
2. Loren Cook Company: www.lorencook.com/#sle.
3. PennBarry, Division of Air System Components: www.pennbarry.com/#sle.
4. Twin City Fan & Blower; BCV: www.tcf.com/#sle.

B Direct Drive Fan:
1. Fan Wheel:
   a. Type: Non-overloading, backward inclined centrifugal.
   b. Material: Aluminum, statically and dynamically balanced.
2. Housing:
   a. Construct of heavy gauge aluminum including curb cap, windband, and motor compartment.
   b. Rigid internal support structure.
   c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
   d. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.
   e. Provide breather tube for fresh air motor cooling and wiring.

C Shafts and Bearings:
1. Fan Shaft:
   a. Ground and polished steel with anti-corrosive coating.
   b. First critical speed at least 25 percent over maximum cataloged operating speed.
2. Bearings:
   a. Permanently sealed or pillow block type.
   b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
   c. 100 percent factory tested.

D Drive Assembly:
1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
2. Belts: Static free and oil resistant.
3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
4. Motor pulley adjustable for final system balancing.
5. Readily accessible for maintenance.

E Disconnect Switches:
1. Factory mounted and wired in NEMA 3R enclosurer.
2. Finish for Painted Steel Enclosures: Provide manufacturer's standard or factory-applied gray unless otherwise indicated.

3. Positive electrical shutoff.
4. Wired from fan motor to junction box installed within motor compartment.

F Drain Trough: Allows for single-point drainage of water, grease, and other residues.

G Options/Accessories:
1. Dampers: Provide motorized type.

H Performance Ratings: As indicated on drawings.

2.9 LABORATORY FUME-EXHAUST FANS

A Manufacturers:
1. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.
2. Loren Cook Company; _____: www.lorencook.com/#sle.
3. Twin City Fan & Blower; TVIFE: www.tcf.com/#sle.

B General Requirements:
1. Fan Type: Roof-curb mounted, constant stack-velocity discharge laboratory exhaust.
2. Minimum air discharge velocity of 3,000 fpm in compliance with ANSI Z9.5.
3. Provide fan-assembly manufactured to sustain structural integrity without external guy-wires or supplemental supports at wind speeds up to 125 mph.
4. Fan performance tested in accordance with AMCA 210, AMCA 260, and AMCA 300.
5. Fan performance ratings certified in accordance with AMCA 211 and AMCA 311.

C Application:
1. Dedicated Fume Hood Exhaust:
   a. Fan Type: Direct-driven, single-speed motor with epoxy-based protective coating.
   b. Exhaust Capacity: Select fan to handle full exhaust airflow rate, system static pressure loss with 15 percent load-capacity factor, and minimum discharge plume height of 10 feet above roof level.

D Fan Section Requirements:
1. Impeller:
   a. Non-overloading, backward-inclined centrifugal.
   b. Material: Aluminum.
2. Fan Shaft:
   a. Ground and polished steel with anticorrosive coating.
   b. First critical speed at least 25 percent over maximum cataloged operating speed.
   c. Enclosed over OSHA recommended safety-yellow painted guards.
3. Bearings:
   a. 100 percent factory tested surface-mounted bearings outside of the airstream.
   b. Operate during a minimum L10 service life in excess of 100,000 hours at maximum cataloged operating speed.
4. Housing:
   a. Construct of heavy gauge aluminum with standard factory finish.
   b. Mounting Base:
      1) External mounting base with lifting lugs.
   c. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.
   d. Provide breather tube for fresh air motor cooling and wiring.
   e. Minimum Assembly Height: 120 inches above the roof surface.
5. Isolation Damper:
   a. With parallel blade damper, constructed of matching materials and finish.
   b. Provided by manufacturer, bolted to access drawer or panel for easy removal from contaminated airstream.
   c. With two-position damper actuator:
      1) Provided by manufacturer.

2) Operate interlocked with fan starter.
3) With integral auxiliary switches to monitor blade position status.
4) Rated for NEMA EN 10250, Type 4 (IP66) environment within protective weather-housing out of contaminated airstream, connected through linkages.

6. Fan Discharge Outlet-Nozzle:
   a. High Plume: Conical shaped nozzle manufactured to facilitate attaining a required air-discharge velocity of constantly to lightly reduced exhaust flows.
7. Fan Inlet Flow Sensor: Provide factory-mounted pitot tube-based differential pressure sensor probe ready for use by TAB to balance fan.

E Fan Bypass Air Plenum:
1. Constant Volume Systems: For constant volume systems, the fan shall be connected directly to the exhaust duct without the need of a bypass air plenum. Fans mounted directly to roof curbs shall be provided with a damper tray located in the roof curb for mounting of the gravity isolation damper.
2. Variable Volume Systems: For variable volume systems, a bypass air plenum shall be provided as shown on drawings. The plenum shall be equipped with a bypass air damper and intake air hood with bird screen for introducing outside air at roof level upstream of the fan.

F Disconnect Switch:
1. Factory-mounted in NEMA EN 10250, Type 3R box wired in compliance with Section 26 05 83.
2. Switchbox Finish: Manufacturer's standard unless otherwise indicated.

G Roof Curbs:
1. 12 inch high, self-flashing of matching material and finish with continuously welded seams.
2. Provide integral formed steel support framework with curb cap guides.

H Performance Ratings: As indicated on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

END OF SECTION

SECTION 23 36 00 - AIR TERMINAL UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Fan-powered units.

1.2 RELATED REQUIREMENTS

A Section 23 05 48 - Vibration and Seismic Controls for HVAC.

B Section 23 31 00 - HVAC Ducts and Casings.

1.3 REFERENCE STANDARDS

A AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).

B AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017 (Reaffirmed 2023).

C ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D ASHRAE Std 130 - Laboratory Methods of Testing Air Terminal Units; 2025.

E ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2019).

F ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope; 2019.

G ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

H NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

I NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

K UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate airflow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

C Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.

1. Include schedules listing discharge and radiated sound power level for each of the second through sixth-octave bands at inlet static pressures of 1 to 4 in-wc.

D Manufacturer's Installation Instructions: Indicate support and hanging details, installation instructions, recommendations, and service clearances required.

E Project Record Documents: Record actual locations of units and locations of access doors required for access of valving.

PART 2 PRODUCTS

2.1 SINGLE-DUCT, VARIABLE-VOLUME AND CONSTANT-VOLUME UNITS

A Manufacturers:
1. Krueger-HVAC: www.krueger-hvac.com/#sle.
2. Metalaire, a brand of Metal Industries Inc; _____: www.metalaire.com/#sle.
3. Price Industries, Inc: www.priceindustries.com/#sle.
4. Nailor Industries
5. Titus

B Basis of Design: Price Industries, Inc: www.priceindustries.com/#sle.
1. Single-Duct Terminal Unit: SDV, (direct digital controls).
2. Single-Duct Terminal Units for Electric Coils: SDV-EC, (electric heating coil with direct digital controls).

C General:
1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.

D Unit Casing:
1. Minimum 22 gauge, 0.0299 inch galvanized steel.
   a. Casing leakage to meet ASHRAE Std 130.
2. Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
3. Unit Discharge: Rectangular, with slip-and-drive connections.
4. Acceptable Liners:
   a. 3/4 inch thick polyurethane foam adhesive complying with UL 181 erosion requirements in accordance with ASHRAE Std 62.1, and having a maximum smoke developed index of 50 for both insulation and adhesive, when tested in accordance with ASTM E84.
   b. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.

E Damper Assembly:
1. Heavy-gauge, galvanized steel, or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
3. Incorporate low leak damper blades for tight airflow shutoff.

F Hot Water Heating Coil:
1. Coil Casing: Minimum 22 gauge, 0.0299 inch galvanized steel, factory-installed on terminal discharge with rectangular outlet, duct connection type.
2. Coil Fins: Aluminum or aluminum plated fins, mechanically-bonded to seamless copper tubes.
3. Coil leak tested to minimum 350 psig.
4. Base performance data on tests run in accordance with AHRI 410 and units to bear AHRI 410 label.

G Electrical Requirements:
1. Single-point power connection.
2. Equipment wiring to comply with requirements of NFPA 70.

H Factory Mounted and Wired Controls:
1. Control Transformers: Factory supplied and mounted for electric and electronic control applications.

2. Wiring Terminations: Fan controls to terminal strip. Terminal lugs to match quantites, sizes, and materials of branch-circuit conductors. Enclose terminal lugs in terminal box that is sized according to NFPA 70.
3. Disconnect Switch: Factory-mounted, fuse type.

I Controls:

2.2 FAN-POWERED SERIES UNITS

A Manufacturers:
1. Krueger-HVAC; _____: www.krueger-hvac.com/#sle.
2. Metalaire, a brand of Metal Industries Inc; _____: www.metalaire.com/#sle.
3. Price Industries, Inc: www.priceindustries.com/#sle.
4. Nailor Industries
5. Titus

B Basis of Design: Price Industries, Inc: www.priceindustries.com/#sle.
1. Constant-Volume Series Fan-Powered Unit: FDC, (direct digital controls).

C General:
1. Factory-assembled and wired, AHRI 880 (I-P) rated, horizontal fan-powered terminal unit with blower, blower motor, mixing plenum, and primary air damper contained in a single unit housing.

D Unit Casing:
1. Minimum 22 gauge, 0.0299 inch galvanized steel.
2. Primary Air Inlet Collar: Suitable for standard flexible duct sizes.
3. Unit Discharge: Rectangular, suitable for flanged duct connection.
4. Acceptable Liners:
   a. 3/4 inch thick polyurethane foam adhesive complying with UL 181 erosion requirements in accordance with ASHRAE Std 62.1, and having a maximum smoke developed index of 50 for both insulation and adhesive, when tested in accordance with ASTM E84.

E Primary Air Damper Assembly:
1. Heavy-gauge, galvanized steel, or extruded aluminum construction with solid shaft rotating in bearings.
2. Provide indicator on damper shaft or alternative method for indicating damper position over full range of 90 degrees.
3. Incorporate low leak (2 percent) damper blades for tight airflow shutoff.
4. Fan(s): Forward curved, centrifugal type.
5. Fan Motor:
   a. ECM (Electrically Commutated Motor):
      1) Brushless DC controlled by an integrated controller/inverter that operates the wound stator and senses rotor position to electrically commutate the stator.
   b. Fan motor shaft directly connected to fan and isolated from unit casing to prevent transmission of vibration.

F Electric Heating Coil:
1. Listed and provided by the terminal unit manufacturer.
2. Coil Casing: Minimum 20 gauge, 0.0359 inch galvanized steel.
3. Heating Elements: Open wire, nickel chrome, supported by ceramic insulators.
4. Integral Control Panel: NEMA EN 10250, Type 2 enclosure, with hinged access door for access to all controls and safety devices.
5. Provide a primary automatic reset thermal cutout and differential pressure airflow switch for proof of airflow or electrical interlock to prevent heater operation when fan is not running.
6. Provide the following additional components, mounted and/or wired within the control enclosure:
   a. Fused or non-fused door interlocking disconnect switch.
   b. Mercury contactors.

c. Fuse block.

7. Provide SCR (Silicon Controlled Rectifier) controller.

G Hot Water Heating Coil:

1. Coil Casing: Minimum 22 gauge, 0.0299 inch galvanized steel, factory-installed on terminal unit with flanged discharge for attachment to downstream ductwork.
2. Heavy-gauge aluminum fins, mechanically bonded to tubes.
3. Copper Tubes: 0.016 inch minimum wall thickness with male solder header connections.
4. Coil leak tested to minimum 305 psig.
5. Base performance data on tests run in accordance with AHRI 410.

H Electrical Requirements:

1. Single-point power connection.
2. Equipment wiring to comply with requirements of NFPA 70.

I Controls:

1. Airflow Sensor: Differential pressure airflow device measuring total, static, and wake pressures.
   a. Signal accuracy: Plus/minus five percent throughout terminal operating range.

PART 3 EXECUTION

3.1 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.

C Provide ceiling access doors or locate units above easily removable ceiling components.

D Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.

E Do not support from ductwork.

F Connect to ductwork in accordance with Section 23 31 00.

END OF SECTION

SECTION 23 64 16 - CENTRIFUGAL WATER CHILLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Centrifugal water chiller.

1.2 RELATED REQUIREMENTS

A Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

B Section 25 35 19 - Integrated Automation Control Valves.

C Section 26 05 83 - Wiring Connections.

1.3 REFERENCE STANDARDS

A AHRI 550/590 (I-P) - Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle; 2023.

B ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Addendum (2024).

C ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2022, with Addendum (2024).

D ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata and Amendments (2022).

F ASHRAE Std 147 - Reducing the Release of Halogenated Refrigerants from Refrigerating and Air-Conditioning Equipment and Systems; 2019, with Addendum (2022).

G ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.

H IEEE 519 - IEEE Standard for Harmonic Control in Electric Power Systems; 2022.

I NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

J UL 508 - Industrial Control Equipment; Current Edition, Including All Revisions.

K UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.

C Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate equipment, piping and connections, valves, strainers, and thermostatic valves required for complete system.

D Manufacturer's Certificate: Certify that components of package not furnished by manufacturer have been selected in accordance with manufacturer's requirements.

E Verifications that Contract Documents are in accodance with manufacturer recommendations:
1. Include with submittal copy of contract documents chilled water piping schematic. Note any modifications required to operate chiller per manufacturer recommendations.

2. Include with submittal copy of Section 230993 - Sequence of Operations for HVAC. Confirm Sequence of Operations are acceptable to manufacture, note any required modifications to ensure chiller(s) operate in manor acceptable to the manufacturer.

F Manufacturer's Certificate: Certify that components of package not furnished by manufacturer have been selected in accordance with manufacturer's requirements.

G Manufacturer's Instructions: Submit manufacturer's complete installation instructions.

H Operation and Maintenance Data: Include start-up instructions, maintenance data, parts lists, controls, and accessories. Include trouble- shooting guide.

I Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

1.6 WARRANTY

A See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of chillers that fail in materials or workmanship within specified warranty period. Warranty indicated shall be independent of acceptance of any Maintenance Agreement accepted.

1. Extended warranties include, but are not limited to, the following:
   a. The manufacturer shall provide a five year parts warranty for the entire compressor assembly. Include coverage for compressor casting, compressor motor, impellers, speed increasing gears, inlet guide vanes, bearings, shafts, motor alignment, gaskets and O-rings, suction elbow and discharge volute. Any refrigerant or at the shaft seal shall be repaired at no cost to the owner. The warranty shall commence at date of substantial completion.
   b. The manufacturer shall provide a five year parts and labor warranty for the complete chiller assembly including structural frame, compressor motor starter and/or variable speed drive, compressor, compressor motor, speed increasing gears, purge (low pressure chillers), condenser and evaporator tube bundles and tubes, control panel, chiller controls and safeties, microprocessor boards, gauges, water boxes, refrigerant relief valves (medium and high pressure chillers), and rupture disks (low pressure chillers). The warranty shall commence at date of substantial completion.
2. The manufacturer shall provide 5-year replacement refrigerant charge warranty.

C Warranty Period: Five years from date of Substantial Completion. Manufacturers and/or their vendors are requried to cover the added warranty cost between the time of delivery/start-up and substaintial completion, chillers manufacturer and or their vendors not covering this cost will not be accepted.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Carrier Corporation

B Daikin McQuay

C York, a brand of Johnson Controls International

D Substitutions: See Section 01 60 00 - Product Requirements.

1. The chilled water system has been designed based on specific capacities and characteristics of equipment specified in this section and other sections.

2. When substitution of a different manufacturer or model number is desired, submit sufficient information to demonstrate to Architect that the substitute will have the same or better performance as that specified AND that the related equipment in the system will perform acceptably with the substitute.
3. If the related equipment must be modified to perform acceptably with the substitute, the entity proposing the substitution is responsible for all additional costs due to re-design and provision of different related equipment.

2.2 CENTRIFUGAL WATER CHILLER

A Refer to drawing schedule for capacity requirements.

B Factory assembled and tested, packaged, water cooled chillers consisting of centrifugal compressors, compressor motor, condenser, evaporator, refrigeration accessories, instrument and control panel including gauges and indicating lights, auxiliary components and accessories, and motor starters.
1. Rating: Comply with AHRI 550/590 (I-P).
2. Safety: Comply with UL 1995.
3. Comply with ASME BPVC-VIII-1 for construction and testing of centrifugal chillers.
4. Comply with ASHRAE Std 15 for safe construction and operation of centrifugal chillers.

C Refrigeration:
1. Refrigerant:
   a. Type: R-513A; ASHRAE Std 34, Class A1.
   b. Compatibility: Chiller parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.
2. Refrigerant Flow Control: Manufacturer's standard refrigerant flow-control device satisfying performance requirements indicated.
3. Pressure Relief Device:
   a. Comply with requirements in ASHRAE Std 15 and in applicable portions of ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
   b. For Chillers Using R-513A: ASME-rated, spring-loaded, pressure relief valve; single- or multiple-reseating type. Pressure relief valve(s) shall be provided for each heat exchanger. Condenser shall have dual valves with one being redundant and configured to allow either valve to be replaced without loss of refrigerant.
4. Refrigeration Transfer: Provide service valves and other factory-installed accessories required to facilitate transfer of refrigerant from chiller to a remote refrigerant storage and recycling system. Comply with requirements in ASHRAE Std 15 and ASHRAE Std 147.
5. Purge System: (Applicable to negative pressure refrigerant machines only)
   a. System shall be a thermal purge design, refrigerant or air cooled, equipped with a carbon filter that includes an automatic regeneration cycle.
   b. Factory wire to chiller's main power supply and system complete with controls, piping, and refrigerant valves to isolate the purge system from the chiller.
   c. Construct components of noncorrodible materials.
   d. Controls shall interface with chiller control panel to indicate modes of operation, set points, data reports, diagnostics, and alarms.
   e. Efficiency of not more than 1 lb of refrigerant per pound of air when rated according to ARI 580.
   f. Operation independent of chiller per ASHRAE Std 147.

D Energy Efficiency: ASHRAE Std 90.1.
1. Refer to drawings for minimum efficiency requirements.

E Evaporator Side:

1. Provide evaporator of shell and tube type, seamless or welded steel construction with cast iron or fabricated steel heads, seamless copper tubes or red brass tubes with integral fins, rolled or silver brazed into tube sheets. Position intermediate tube support sheets along length of shell to avoid contact and relative motion between adjacent tubes.
2. Test and, where applicable, stamp refrigerant side for 45 psi working pressure and water side for 150 psi working pressure, in accordance with ASME BPVC-VIII-1.
3. Insulate evaporator and cold surfaces with 0.75 inch minimum thick flexible expanded polyvinyl chloride insulation with maximum K factor of 0.28.
4. Provide thermometer wells or thermistors for temperature controller and low temperature cutout.
5. Design and construct evaporator to prevent liquid refrigerant from entering the compressor.
6. Provide carbon rupture disc or relief valve on shell in accordance with ASHRAE Std 15.
7. Construction and materials to comply with ASME BPVC-VIII-1 or ASHRAE Std 15 as applicable to chiller manufacturer and chiller model.
8. Minimum Wall Thickness: 0.028" at intermediate tube supports.

F Condenser Side:

1. Provide condensers of shell and tube type, seamless or welded steel construction with cast iron or fabricated steel heads, seamless copper tubes or red brass tubes with integral fins, rolled or silver brazed into tube sheets. Position intermediate tube support sheets along shell length to avoid contact and relative motion between adjacent tubes.
2. Test and, where applicable, stamp refrigerant side for 45 psi working pressure and water side for 150 psi working pressure, in accordance with ASME BPVC-VIII-1.
3. Provide carbon rupture disc or relief valve on shell in accordance with ASHRAE Std 15.
4. Provide baffles to ensure even distribution of incoming gas and to concentrate noncondensible gases.
5. Construction and materials to comply with ASME BPVC-VIII-1.
6. Minimum Wall Thickness: 0.035" at intermediate tube supports.

G Purge System:

1. Provide purge system on positive pressure units, incorporating a low temperature refrigeration system to automatically remove noncondensibles, water and air.
2. Limit system discharge to maximum of 0.60 pound of refrigerant per pound of air discharged.

H Centrifugal Compressor:

1. Compressors (Requiring Oil): Single-stage or multistage, variable-displacement, integral variable frequency controller, and digital electronic controls.
2. Compressors (Maginet/Oil Less Type): Single-stage or multistage, variable-displacement, magnetic bearing centrifugal-type compressor driven by an electric motor(s) using oil-free compressor technology using, magnetic bearings, integral variable frequency controller, and digital electronic controls.
3. Compressor Casing: Cast iron, horizontally or vertically split with machined passages and leak tested to 45 psi. Provide refrigerant sight glass.
4. Impellers: Single or multi-stage, in-line design, fully shrouded, statically and dynamically balanced, tested to 20 percent over operating speed, mounted on heat treated forged or rolled steel shaft, nonferrous, labyrinth seals between stages.
5. Bearings: Steel or aluminum journal bearings, pressure lubricated.
6. Gear Box: Double helical design, symmetrical and center supported by spherically seated, self-aligning bearing, arranged for inspection without disassembly.
7. Motor: Hermetically sealed, single speed, low slip induction type; see Section 23 05 13.
8. Lubrication: Oil pump, with oil cooler, pressure regulator, oil filters, thermostatically controlled oil heater, and motor controls. Interlock to start before chiller motor and run after motor is shut down. Provide sight glass or electronic sensors for monitoring oil level.
9. Lubrication System:
   a. Force-feed oil to all bearings, gears and rotating surfaces
   b. Oil reservoir: designed in accordance with ASME; contains oil pump and oil heater

c. Oil pump: positive-displacement type, submerged in oil reservoir.
d. Oil filter: single filter or dual filter, externally mounted, ½ micron, replaceable cartridge, with service valves
e. Oil return system: oil eductor to recover and return oil in the evaporator to the main oil sump.
f. Oil cooler: refrigerant cooled, factory mounted, factory piped and pressure tested
g. Oil heater: immersion type or belly band type, thermostatically controlled
h. Oil temperature: sense via thermocouple located between bearing pads
i. Pump operation: automatically operate oil pump for 50 seconds (minimum) prior to startup. Prevent start¬up until operating oil pressure is established via an interlock with the control panel. Maintain pressure during compressor coastdown, and for 2 minutes (minimum) after coastdown.
j. Means of lubrication after power failure during coast down of driveline. A gravity-fed oil reservoir or a UPS / battery backup to oil pump or a shaft-driven oil pump are acceptable.

10. Refrigerant: Factory precharge unit with refrigerant specified above.

I Electrical Starters and Drives, Low Voltage (208 to 600 VAC):

1. Water-Cooled, Unit-Mounted Variable Frequency Drive (VFD):
   a. Specifically design VFD to interface with the centrifugal water chiller controls and allow for the operating ranges and specific characteristics of the chiller. VFD-control logic is to optimize chiller efficiency by coordinating compressor motor speed and compressor inlet guide vane position to maintain the chilled water setpoint while avoiding surge. If surge is detected, VFD is to move away from and avoid surge at similar conditions in the future.
   b. Efficiency: 97 percent or better at full speed and full load.
   c. Fundamental Displacement Power Factor: Minimum of 0.97.
   d. Provide voltage and current regulated, solid state, microprocessor-based pulse-width modulated (PWM). Output power devices to be IGBT transistors.
   e. Provide liquid- or air-cooled heatsink to cool power semiconductor and capacitor.
   f. House VFD in NEMA Type 1 metal enclosure having a minimum short circuit withstand rating of 65,000 amps per UL 508. Include three phase input lugs plus a grounding lug for electrical connections, output motor connection via factory installed bus bars and components properly segregated and completely enclosed in a single metal enclosure.
      1) Enclosure to include padlockable, door-mounted circuit breaker with minimum AIC rating of 65,000 amps.
      2) Entire chiller package to be listed by Underwriter's Laboratories Inc.
   g. Test VFD according to UL 508 and listed by a National Recognized Testing Laboratory (NRTL) as designated by OSHA.
   h. Active Harmonic Distortion Filter: Factory mounted and wired, IEEE 519 compliant. Maximum of 5% total harmonic distortion. All losses associated with the harmonic filter shall be incorporated into the chiller’s efficiency. Passive filters are not acceptable.
   i. Line Frequency: 38 to 60 Hertz with plus or minus 10 percent tolerance.
   j. VFD is to include the following features:
      1) Control circuit voltages physically and electrically isolated from power circuit voltage.
      2) 150 percent instantaneous torque available for improved surge control.
      3) Soft start, adjustable linear acceleration, coast-to-stop.
      4) Adjustable current limiting and UL-approved electronic motor overload protection.
      5) Insensitivity to incoming power phase sequence.
      6) VFD and motor protection from the following faults:
         (a) Output line-to-line short circuit.
         (b) Line-to-ground short circuit.
         (c) Phase loss at AFD input.
         (d) Phase reversal/imbalance.
         (e) Over-voltage.
         (f) Under-voltage.

(g) Over-temperature.

k. VFD Status Indicators:
1) Output speed in hertz and rpm.
2) Input line voltage.
3) Input line kW.
4) Output/load amps.
5) Average current in percent RLA.
6) Load power factor.
7) Fault.
8) VFD transistor temperature.

l. Service Conditions:
1) Operating Ambient Temperature: 14 to 104 degrees F.
2) Room Ambient Relative Humidity: Up to 95 percent.
3) Elevation: Up to 3,300 feet. For every 3,300 feet above 3,300 feet, decrease the rated output current by 4 percent up to 9,900 feet.

J Controls Package:

1. Unit Controls: Factory-supplied DDC:
a. Control-panel mounted with required input-output expansions, power supply, fused disconnect, hand switches, knobs, and accessories required to control chiller unit to manufacturer required sequences to meet intended use with listed performance.
b. Factory configured to interface prewired sensors, switches, and safeties with allowance to add up to four chiller valves and flow sensors.
c. Graphic-based touchscreen to include unit operation controls and user filter based interface for faults, alarms, performance, unit diagnostics, and data recording up to 12 months.
d. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.
e. External Point Mapping: Provide mapping table for each parameter included in the local visual interface with software-toggle flag to allow reduced mapping of available points.
f. Isolation Valves: Field-installed, 2-position, butterfly type with position tracking; see Section 25 35 19.
2. Disconnect Switch: Factory mount disconnect switch in starter control panel.
3. On or near chiller, provide microprocessor based control panel containing solid state, fully automatic operating and safety controls.
4. Provide the following manufacturer's standard safety controls, including the following minimum functions, so that operating any one will shut down machine and require manual reset:
a. Low evaporator refrigerant temperature.
b. High condenser refrigerant pressure.
c. Low oil pressure.
d. Low refrigerant evaporator pressure.
5. Provide the manufacturer's standard safety controls arranged so that operating any one will shut down machine and automatically reset.
6. Provide the following devices on control panel:
a. Manual Switches:
1) Machine off-auto switch.
2) Oil pump switch, manual or automatic.
3) Purge pump switch, manual-off-auto.
4) Machine selector switch to allow load, unload, hold or automatic operation.
b. Manual Setpoint Adjustments:
1) Leaving chilled water temperature.
2) Current demand limit.
c. Status Lights:
1) Chilled water flow proven.
2) Cooling required.
3) Unit running.

4) Unit loading.
5) Unit unloading.
6) Manual reset required.
7) Remote chilled water setpoint active.
8) Remote current water setpoint active.

d. Setpoint and Temperature Display:
1) Chilled water setpoint.
2) Current limit setpoint.
3) Entering evaporator water temperature.
4) Leaving evaporator water temperature.
5) Entering condenser water temperature.
6) Leaving condenser water temperature.

7. Provide the following operating controls:
a. Solid state, chilled water temperature controller that controls electronic guide vane operator and hot gas bypass. Locate temperature sensor in entering chilled water.
b. Adjustable thirty minute off timer prevents compressor from short cycling.
c. Demand limit device to manually set maximum current infinitely between 40 percent and 100 percent of full load amperes.
d. Automatic start that determines demand for chilled water from proof of chilled water flow and temperature differential between chilled water setpoint and supply temperature.

K Electrical:
1. Compliance: NEMA EN 10250 or UL 1995 as applicable.

L Accessories:
1. Flow Switches: Chiller manufacturer shall furnish a factory mounted and wired thermal dispersion flow switch for each evaporator and condenser water nozzle and verify field-mounting location before installation.
2. Vibration Isolation:
a. Chiller manufacturer shall furnish vibration isolation for each chiller.
b. Neoprene Pad:
1) Two layers of 0.375-inch-thick, ribbed- or waffle-pattern neoprene pads separated by a 16-gage, stainless-steel plate.
c. Fabricate pads from 40- to 50-durometer neoprene.
d. Remotely coordinated by chiller plant {CH#382852}; see Section {CH#382851}.

PART 3 EXECUTION

3.1 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Provide for connection to electrical service.

C Provide for connection of electrical wiring between starter and chiller control panel, oil pump, and purge unit.

D Install units on vibration isolation.

E Provide evaporator connections to chilled water piping. Refer to piping diagrams for all requirements.

F Furnish and install necessary auxiliary water piping for oil cooling units and purge condensers.

G Insulate evaporator and cold surfaces.

H Provide condenser connection to condenser water piping.

I Arrange piping for easy dismantling to permit tube cleaning.

J Provide piping from chiller rupture disc to outdoors. Size as recommended by manufacturer.

K Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface.

L Install refrigerant monitoring system. Install interlock wiring between devieces in conduit as required for a fully functioning system.

3.2 SYSTEM STARTUP

A See Section 01 78 00 - Closeout Submittals for closeout submittals.

B See Section 01 79 00 - Demonstration and Training for additional requirements.

C Provide services of factory trained representative for minimum of as required to leak test, refrigerant pressure test, evacuate, dehydrate, charge, start-up, and calibrate controls.

D Supply initial charge of refrigerant and oil.

3.3 CLOSEOUT ACTIVITIES

A See Section 01 78 00 - Closeout Submittals for closeout submittals.

B See Section 01 79 00 - Demonstration and Training for additional requirements.

C Train operating personnel in operation and maintenance of units.

D Provide the services of the manufacturer's field representative to conduct training.

END OF SECTION

SECTION 23 64 23 - SCROLL WATER CHILLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Air-cooled scroll water chillers.

1.2 RELATED REQUIREMENTS

A Section 03 30 00 - Cast-in-Place Concrete: Concrete housekeeping pads.

B Section 23 21 13 - Hydronic Piping.

C Section 23 21 14 - Hydronic Specialties.

D Section 25 35 19 - Integrated Automation Control Valves.

E Section 26 05 83 - Wiring Connections.

1.3 REFERENCE STANDARDS

A AHRI 550/590 (I-P) - Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle; 2023.

B ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Addendum (2024).

C ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata and Amendments (2022).

D ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.

E ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.

F NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

G UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.

C Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate equipment, piping and connections, valves, strainers, and thermostatic valves required for complete system.

D Manufacturer's Certificate: Certify that components furnished but not produced by manufacturer meet or exceed manufacturer's requirements.

E Manufacturer's Performance Data: Indicate energy input versus cooling load output from 0 to 100 percent of full load at specified and minimum condenser water temperature for water-cooled chillers and at specified and minimum outdoor air temperature for air-cooled chillers.

F Manufacturer's Instructions: Submit manufacturer's complete installation instructions.

G Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A Comply with manufacturer's written installation instructions for rigging, unloading, and transporting units.

B Deliver units to the job site completely assembled and charged with refrigerant and oil by manufacturer.

1.6 WARRANTY

A See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B Manufacturer's Warranty: Provide minimum five year warranty to include coverage for materials and labor for compressor and complete assembly.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Carrier Corporation; _____: www.carrier.com/#sle.

B Daikin Applied Americas, Inc; _____: www.daikinapplied.com/#sle.

C York, a brand of Johnson Controls International, PLC; _____: www.york.com/#sle.

D Substitutions: See Section 01 60 00 - Product Requirements.
1. The chilled water system has been designed based on specific capacities and characteristics of equipment specified in this section and other sections.

2.2 SCROLL-WATER CHILLER PERFORMANCE REQUIREMENTS

A Packaged Air-Cooled Chiller:
1. Refrigerant: R-32
2. Evaporator:
   a. Fouling Factor: 0.00010 sq ft-hr-degrees F/Btu.
3. Packaged Air-Cooled Condenser:

2.3 AIR-COOLED, SCROLL WATER CHILLER

A Factory assembled and tested chiller consisting of compressor(s), compressor motor(s), evaporator, condenser, enclosure, refrigeration circuits(s) and specialties, interconnecting piping, starters, and microprocessor-based controls.
1. Rating: AHRI 550/590 (I-P).
2. Safety: UL 1995 and ASHRAE Std 15.
3. Construction and Testing: ASME BPVC-VIII-1 as applicable for construction type.
4. Enclosures:
   a. Frame: Heavy-gauge steel with hot-dipped galvanized or air-dried paint finish.
   b. Steel Cabinets: Factory apply baked on enamel or baked on powder paint finish.
   c. Perform 500-hour minimum salt spray test in accordance with ASTM B117.

B Hermetic Scroll Compressor:
1. Unit: Fully hermetic type with multiple, direct drive compressors with discharge and suction service valves.
2. Vibration Control: Factory installed internal isolators or field installed external isolators.
3. Oil Lubrication System: Initial oil charge, oil sump, heater, oil level, and sight glass.
4. Capacity Reduction System: Compressor staging with control down to 12 percent of full load without the activation of hot gas bypass.
5. Motor: 3600 or 3500 rpm, suction gas-cooled, with thermal or current overload protection.

C Evaporator:
1. Shell and tube type.
   a. Shell, removable heads and tube support sheets constructed of carbon steel.

b. Tubes: Mechanically treated copper tubes fixed and aligned into intermediate tube support sheets across the shell to maintain consistent spacing between tubes.
c. Working Pressure Rating, Refrigerant Side: 400 psi minimum.
d. Working Pressure Rating, Water Side: 150 psi minimum.
e. End Connections: Provide with flanged or grooved connections.
f. Cold Surfaces Insulation.
1) Insulation is factory or field installed on shell, connections, and suction piping.
2) 0.75 inches minimum thick, closed cell, expanded polyvinyl chloride, polyurethane, or vinyl nitrate polymer insulation with a maximum K factor of 0.28.
g. Provide factory installed vents and water drain connections on evaporator or piping.
h. Provide factory or field installed fittings for temperature control sensors on evaporator or piping.
i. Freeze Protection for Outdoor Locations: Provide thermostatically controlled electric heater to protect from freezing at ambient temperatures down to minus 20 degrees F.

D Air-Cooled Condenser, Finned-Tube Type:
1. Finned-Tube Type:
a. Mechanically bond aluminum fins to copper tubing and protect with corrosion resistant materials or coatings.
b. Clean, dehydrate and test.
c. Leak Test: 650 psi minimum.
2. Coil Guards: Provide corrosion proof, louvered panels or grilles, factory installed. Protect condenser coil by enclosing with heavy plastic to prevent damage during shipping or rigging.
3. Fans and Motors:
a. Fans: Dynamically balance propeller, shrouded-axial, or airfoil type fans of reinforced polymer or glass fiber reinforced composite corrosion resistant construction equipped with sealed, permanently lubricated ball bearings.
b. Discharge Fan Guards: Corrosion resistant, heavy gauge, steel wire.
c. Discharge Direction: Vertical.
d. Motors: Direct drive, totally enclosed for outdoor use with current overload protection.

E Refrigerant Circuits:
1. Provide multiple independent refrigeration circuits with one or multiple compressor(s) per circuit.
2. Provide liquid line shut-off valve, filter-drier, expansion valve, and refrigerant relief device for each independent circuit.

F Controls Package:
1. Unit Controls: Factory-supplied DDC:
a. Control-panel mounted with required input-output expansions, power supply, fused disconnect, hand switches, knobs, and accessories required to control chiller unit to manufacturer required sequences to meet intended use with listed performance.
b. Factory configured to interface prewired sensors, switches, and safeties with allowance to add up to four chiller valves and flow sensors.
c. Graphic-based touchscreen to include unit operation controls and user filter based interface for faults, alarms, performance, unit diagnostics, and data recording up to 12 months.
d. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.
e. External Point Mapping: Provide mapping table for each parameter included in the local visual interface with software-toggle flag to allow reduced mapping of available points.
f. Isolation Valves: Field-installed, 2-position, butterfly type with position tracking; see Section 25 35 19.
2. Prewire, assemble, factory mount, and test operating and safety control system consisting of a digital display or gauges, on-auto-off switch, motor starters, disconnect switches, power and control wiring. Provide controls, monitoring, programmable setpoints, alarms, and BAS as defined below:
a. Automatic Adjustable Operating Controls:
1) Temperature of chilled water leaving chiller.

2) Chiller system capacity control based on setpoints and system load.
3) Compressor short-cycling prevention.
4) Lead/lag for multiple compressors.
5) Automatic reset on power source failure.
6) Load limiting.

b. Normal Operation Monitoring and Open Coverless Displays:
1) Hours of operation.
2) Suction and discharge refrigerant pressures.
3) Automatic diagnostics.
4) Number of starts.
5) On/off compressor status.
6) Entering and leaving chilled water temperatures.
7) Status of operation.
8) Condenser water entering and leaving temperatures.
9) Weekly purge cycle totalization if applicable.
10) Oil pressure.

c. Setpoints:
1) Leaving chilled water temperature.
2) Date/time.

d. Automatic Chiller Shut-Down Safety Controls and Alarm:
1) Automatic Reset:
(a) Chilled water flow interlock.
(b) Voltage protection; over and under.
(c) Phase reversal protection.
2) Manual Reset:
(a) Evaporator low pressure.
(b) High motor winding temperature.
(c) Low chilled water temperature.
(d) Low chilled water flow.
(e) High condenser refrigerant discharge pressure.
(f) Motor current overload and phase loss.
(g) Low oil flow.
3) Remote Alarm: Activate remote, audible bell upon safety shutdown of chiller.

e. Points for Remote Monitoring and Control:
1) Minimum Data Transmission to BAS:
(a) All system operating conditions.
(b) Capacity control information.
(c) Safety shutdown conditions.
2) Minimum Operating Commands from BAS:
(a) Remote unit start/stop.
(b) Remote chilled water reset.

G Electrical:
1. Compliance: NEMA EN 10250 or UL 1995 as applicable.

PART 3 EXECUTION

3.1 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Align chiller package on steel or concrete foundations.

C Install units on vibration isolators.

D Connect to electrical service.

E Connect to chilled water piping.

F Arrange piping for easy dismantling to permit tube cleaning and removal.

END OF SECTION

SECTION 23 73 13 - MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Casing construction.

B Fan section.

C Coil section.

D Filter and air cleaner section.

E Damper section.

F Ultraviolet lights.

G Access section.

1.2 RELATED REQUIREMENTS

A Section 23 34 16 - Centrifugal HVAC Fans.

1.3 REFERENCE STANDARDS

A ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings; 2014 (Reaffirmed 2020).

B ACGIH - Ultraviolet Radiation: TLV(R) Physical Agents 7th Edition Documentation; 2010.

C AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).

D AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

E AMCA 99 - Standards Handbook; 2016.

F AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.

G AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

H AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

I ASTM B177/B177M - Standard Guide for Engineering Chromium Electroplating; 2011 (Reapproved 2021).

J NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

L UL (DIR) - Online Certifications Directory; Current Edition.

M UL 153 - Portable Electric Luminaries; Current Edition, Including All Revisions.

N UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

O UL 1598 - Luminaires; Current Edition, Including All Revisions.

P UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data:

1. Published Literature: Indicate dimensions, weights, capacities, ratings, gauges and finishes of materials, and electrical characteristics and connection requirements.

2. Filters: Data for filter media, filter performance data, filter assembly, and filter frames.
3. Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.
4. Sound Power Level Data: Fan outlet and casing radiation at rated capacity.
5. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

C Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

D Manufacturer's Instructions: Include installation instructions.

E Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

F Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements for additional provisions.

1.5 DELIVERY, STORAGE, AND HANDLING

A Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

B Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

C Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.6 WARRANTY

A See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Carrier Global Corporation: www.carrier.com/#sle.

B Daikin Applied: www.daikinapplied.com/#sle.

C Trane Technologies, PLC: www.trane.com/#sle.

D York, a brand of Johnson Controls International, PLC: www.york.com/#sle.

E Temptrol, Nortek Air Solutions: www.nortekair.com/brand/temtrol/#sle.

2.2 REGULATORY REQUIREMENTS

A Comply with NFPA 70.

B Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

2.3 CASING CONSTRUCTION

A Full Perimeter Base Rail:
1. Construct of galvanized steel.
2. Provide base rail of sufficient height to raise unit for external trapping of condensate drain pans.

B Casing:

1. Forming: Form walls, roofs, and floors with at least two breaks at each joint. Provide 2” double wall construction on all walls, doors, roofs and floors. Provide 20 gauge exterior and 20 gauge interior foam filled panels. Provide minimum 16 gauge interior and 20 gauge foam filled exterior galvanized steel floor. Units shall be designed and constructed such that all exterior panels are non-load bearing.
2. Provide mid-span, no through metal, internal thermal break.
3. Construct outer panels of galvanized steel and inner panels of galvanized steel.
4. Casing Air Pressure Performance Requirements:
    a. Able to withstand up to 8 in-wc positive or negative static pressure.
    b. Not to exceed 0.0042 inches per inch deflection at 1.5 times design static pressure up to a maximum of plus 8 in-wc in positive pressure sections and minus 8 in-wc in negative pressure sections.
5. Apply manufacturer's standard coating immediately after cleaning and pretreating, un-coated galvanized steel is not acceptable.
6. Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1

C Casing Insulation and Adhesive:
1. Insulation: ASTM C 1071, Type II, 2” thick 3 pound or 2” foam filled R-12.
2. Location and Application: Encased between outside and inside casing.

D Access Doors:
1. Construction, thermal and air pressure performance same as casing.
2. Doors shall be provided with neoprene gaskets, applied around entire perimeter of the panel frames.
3. Provide surface mounted handles on hinged, swing doors.
4. Hinges: A minimum of two ball-bearing hinges or stainless-steel piano hinge and two wedge-lever-type latches, operable from inside and outside. Arrange doors to be opened against air-pressure differential.
5. Provide Access Doors in the Following Locations:
    a. Fan section.
    b. Access sections.
    c. Coil sections.
    d. Filter sections.
    e. Mixing sections.

E Casing Leakage: Seal joints and provide airtight access doors so that air leakage does not exceed one percent of design flow at 8-in wc positive or negative static pressure.

F Insulation:
1. Foam filled, provide minimum thermal thickness of 12 R throughout.
2. Completely fill panel cavities in each direction to prevent voids and settling.
3. Comply with NFPA 90A.

G Drain Pan Construction:
1. Provide cooling coil and humidifier sections with an insulated, double wall, stainless steel drain pan complying with ASHRAE Std 62.1 for indoor air quality and sufficiently sized to collect all condensate.
2. Slope in two planes to promote positive drainage and eliminate stagnate water conditions.
3. Locate outlet of sufficient diameter at lowest point of pan to prevent overflow at normal operating conditions.
4. Provide threaded drain connections constructed of drain pan material, extended sufficient distance beyond the base to accommodate field installed, condensate drain trapping.

H Finish:
1. Indoor Units:
    a. Provide exterior, galvanized steel panels with painted surface complying with ASTM B177/B177M.

b. Color: Manufacturer's standard color.

2.4 FAN SECTION

A Type: Air foil, single width, single inlet, centrifugal plug fan, in accordance with AMCA 99. See Section 23 34 16

B Performance Ratings: Determined in accordance with AMCA 210 and labeled with AMCA Certified Rating Seal.

C Sound Ratings: AMCA 301; tested to AMCA 300 and label with AMCA Certified Sound Rating Seal.

D Bearings: Self-aligning, grease lubricated, with lubrication fittings extended to exterior of casing with plastic tube and grease fitting rigidly attached to casing.

E Mounting:
1. Locate fan and motor internally on welded steel base coated with corrosion resistant paint.
2. Factory mount motor on slide rails.
3. Provide access to motor, drive, and bearings through removable casing panels or hinged access doors.
4. Internal Vibration Isolation: Fans shall be factory mounted with manufacturer's standard restrained vibration isolation mounting devices having a minimum static deflection of 2-inches.

F External Motor Junction Box: Factory mount NEMA 4 external junction box and connect to extended motor leads from internally mounted motors.
1. All fan motors shall be factory-wired to individual manual motor protection [MMP] device which shall consist of a motor overload relay with adjustable current rating and an on-off disconnect switch for power isolation. Field wiring of MMP’s to fan motors shall not be permitted.
2. MMP’s shall be contained in a single control panel [MMP panel] and shall be mounted on the exterior wall panel of the fan array section.
3. MMP panel shall have a single point of connection for input power wiring and shall feed power individual MMP’s through a common busbar. Independent wiring of input power to individual MMP’s shall not be permitted.

G Motor Wiring Conduit: Factory wire fan motor wiring to the unit mounted external motor junction box.

H Fan Accessories:
1. See Section 23 34 16

I Flexible Duct Connections:
1. For separating fan, coil, and adjacent sections.

J Drives:
1. Comply with AMCA 99.
2. Bearings: Heavy duty pillow block type, roller bearings with ABMA STD 11 L-10 life at 120,000 hours.
3. Shafts: Solid, hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.

2.5 COIL SECTION

A Casing: Provide access to both sides of coils. Enclose coils with headers and return bends exposed outside casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.

B Drain Pans: 24 inch downstream of coil and down spouts for cooling coil banks more than one coil high.

C Eliminators: Three break of Type 304 stainless steel, mounted over drain pan.

D Air Coils:
1. Certify capacities, pressure drops, and selection procedures in accordance with AHRI 410.

E Fabrication:
1. Tubes: 5/8 inch OD seamless copper expanded into fins, brazed joints.
2. Fins: Aluminum.
3. Casing:
   a. Chilled Water Coils: Die formed channel frame of stainless steel.
   b. Hot Water Coils: Die formed channel frame of galvanized steel.

F Water Heating Coils:
1. Headers: Cast iron, seamless copper tube, or prime coated steel pipe with brazed joints.
2. Configuration: Drainable, with threaded plugs for drain and vent; serpentine type with return bends on smaller sizes and return headers on larger sizes.

G Water Cooling Coils:
1. Headers: Cast iron, seamless copper tube, or prime coated steel pipe with brazed joints.
2. Configuration: Drainable, with threaded plugs for drain and vent; threaded plugs in return bends and in headers opposite each tube.

2.6 FILTER AND AIR CLEANER SECTION

A General: Provide filter sections with filter racks, minimum of one access door for filter removal, and filter block-offs to prevent air bypass.

B Filter Frame:
1. Filter Rack: Side-access rack designed to hold the metal headers.
2. Filter Slots: Frames shall contain independant slots to house 2 inch and 4 inch filter media.

C Pleated Media Filters:
1. Media: 2 inch, pleMERV 8, 100 percent synthetic fibers, continuously laminated to a grid with water repellent adhesive, and capable of operating up to a maximum of 625 fpm without loss of efficiency and holding capacity.

D Differential Pressure Gauge:
1. Provide factory installed dial type differential pressure gauge, flush mounted with casing outer wall, and fully piped to both sides of each filter to indicate status.
2. Maintain plus/minus 5 percent accuracy within operating limits of 20 degrees F to 120 degrees F.

2.7 DAMPER SECTION

A Control Dampers: Low leakage (Class 1A) Control dampers. See Section 23 33 00 - Air Duct Accessories.

B Mixing Section: Provide a functional section to support the damper assembly for modulating the volume of outdoor, return, and exhaust air.

C Internal Face Damper Section: Provide as indicated within the air handling unit.

2.8 ULTRAVIOLET LIGHTS

A Manufacturers:
1. Sanuvox Technologies Inc; Biowall: www.sanuvox.com/#sle.
2. Steril-Aire, Inc; Rapid Install Kit: www.steril-aire.com/#sle.
3. UV Resources; RLM Xtreme: www.uvresources.com/#sle.

B Tested and recognized by UL 153, UL 1598, and UL 1995 for luminaries, heating, and cooling equipment.

C UV-C Short Wave Light Array Performance: Provide not less than 190 microwatts/sq in.

D Materials:
1. Provide UV-C resistant polymeric materials or shield from direct or indirect UV-C light with UV-C tolerant material.
2. UV-C Fixtures: Stainless steel to resist corrosion.

E Lamp Life: 9000 hours minimum with no more than 20 percent loss of output after two years of continuous use.

F Control Panel: Provide control panel for each UV-C light array.
1. Comply with UL 508A.
2. Use components marked with minimum SCCR (Short Circuit Current Rating).
3. Provide enclosure with NEMA 4X rating for prevention of corrosion and water ingress.
4. Provide control panel with current sensor to indicate status of UV-C array.

G Safety Features:
1. Treat view port and other windows to assure UV-C energy emitted is below threshold limit specified by American Conference of Governmental Industrial Hygienists (ACGIH).
2. Provide mechanical interlock switch to disconnect power to UV-C fixtures when opening access door.
3. Provide externally mounted, on-off, disconnect, and shutoff switch with lockout/tagout that disconnects UV-C power and prevents unwanted operation of UV-C lights.

2.9 ACCESS SECTION

A Provide where indicated on drawings to allow for inspection, cleaning, and maintenance of field-installed components.

B Construct access doors same as previously specified within this Section.

PART 3 EXECUTION

3.1 INSTALLATION

A Install in accordance with manufacturer's instructions.

B Bolt sections together with gaskets.

C Install flexible duct connections between fan inlet and discharge ductwork and air handling unit sections. Ensure that metal bands of connectors are parallel with minimum 1 inch flex between ductwork and fan while running.

D Provide fixed sheaves required for final air balance.

E Make connections to coils with unions or flanges.

F Hydronic Coils:
1. Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
2. Provide shut-off valve on supply line and lockshield balancing valve with memory stop on return line.
3. Locate water supply at bottom of supply header and return water connection at top.
4. Provide manual air vents at high points complete with stop valve.
5. Ensure water coils are drainable and provide drain connection at low points.

G Cooling Coils:
1. Pipe drain and overflow to nearest floor drain.

3.2 SYSTEM STARTUP

A Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.

B UV-C system to be commissioned by manufacturer field representative.

3.3 CLOSEOUT ACTIVITIES

A See Section 01 78 00 - Closeout Submittals for closeout submittals.

B Demonstration: Demonstrate operation of system to Owner's personnel.
1. Use operation and maintenance data as reference during demonstration.
2. Briefly describe function, operation, and maintenance of each component.

END OF SECTION

SECTION 26 01 00 - ELECTRICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Electrical General Requirements specifically applicable to Division 26 Sections, in addition to Division 01 - General Requirements.

B Definitions common to Division 26 specification sections.

1.2 RELATED REQUIREMENTS

A Drawings, addenda and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification Sections, apply to this and all other sections of Division 26.

B This section is related to all other sections of Division 26.

1.3 DEFINITIONS

A Words "Architect" where written in Division 26 specifications and drawings refer to commissioned Design Professional, whose name appears on contract documents.

B Word "Engineer" where written in Division 26 specifications and drawings refers to Consulting Electrical Engineer, CMTA, Inc.

C Word "Contractor" where written in Division 26 specifications and drawings refers to Electrical Contractor and any and all of his subcontractors.

D Word "Furnish" where written in Division 26 specifications and drawings shall mean Contractor shall deliver to the site item(s) specified, as well as additional specialized materials and/or accessories necessary for the use and operation of item or items specified.

E Word "Install" where written in Division 26 specifications and drawings shall mean Contractor shall set in position, connect (including sub-assemblies furnished), and adjust for use. Contractor shall furnish miscellaneous specialty items such as fittings, hangers, fastening devices, etc., as obviously necessary for a complete and operating installation.

F Word "Material" where written in Division 26 specifications and drawings shall mean any and all apparatus, equipment, devices, fixtures, components, products, assemblies, items, parts, things, and any other pieces specified or shown or required.

G Word "Labor" where written in Division 26 specifications and drawings shall mean any and all physical effort, manpower, time, expertise, tools, equipment and services to carefully assemble, install and affix all material in a proper, complete and acceptable manner.

H Word “Low Voltage” where written in Division 26 specifications and drawings shall mean 0 to 1,000 Volts (IEEE).

I Word "Provide" where written in Division 26 specifications and drawings shall mean Contractor shall perform all labor and furnish all materials and equipment necessary to that specified item or system will be complete and operational in every respect.

J Performance Verification Testing refers to test performed in the field to ensure proper operation and / or installation of service or products.
1. Unless noted otherwise, Performance Verification Testing is not required to be provided by a third party testing firm.
2. Unless noted otherwise, Performance Verification Testing is not required to be witnessed by the Electrical Engineer, Owner, Architect, and / or (if applicable) Commissioning Agent.

K Acceptance Testing refers to formal testing process required prior to acceptance by the Owner.

1. Unless noted otherwise Acceptance Testing is required to be provided by a third party testing firm.
2. Unless noted otherwise, Acceptance Testing is required to be witnessed by the Electrical Engineer, Owner, Architect, and / or (if applicable) Commissioning Agent.

L As-built drawings are prepared by the contractor. They show, in red ink, on-site changes to the original construction documents.

M Record drawings are prepared by the Architect or Engineer and reflect on-site changes the contractor noted in the as-built drawings.

N Quality Assurance includes all the planned and systematic activities implemented that can be demonstrated to provide confidence that a product or service will fulfill requirements for quality. Typically, quality assurance procedures are performed before and while the work is being performed. As such in the Division 26 specifications Quality Assurance procedures are specified in Part 1.

O Quality Control includes all the planned activities required to verify quality after the work has been performed. This can include testing and inspections along with other procedures. As such in the Division 26 specifications Quality Assurance procedures are specified in Part 3.

1.4 SCOPE OF WORK

A All Specifications, corresponding Drawings and all Addenda form a complete set of documents for electrical work for this project, and no part shall be considered complete without the other.

B The Specifications, Drawings, and all Addenda describe both the design characteristics and functional performance criteria that the completed electrical systems shall include.

C Contractor shall obtain all required licenses, permits, plan reviews, inspections and pay all fees, costs and all other charges for this project. All sales, use and any other taxes shall be paid by Contractor.

D Electrical Work shall comply with all ordinances, laws, regulations and codes applicable to the work involved. If, in any instance, the plans and specifications conflict with such laws, the stricter requirement shall take preference.
1. If Contractor is aware of conflicts between drawings or specifications and such codes or regulations, they shall be brought to the Engineer's attention prior to commencing work. If Contractor performs work in violation of such codes or regulations, Contractor shall correct the violation at his expense.

E Work under Division 26 includes providing all labor and materials necessary for satisfactory completion of all electrical work shown on all drawings and in all specification divisions.

1.5 SITE INVESTIGATION

A Prior to submitting bids, visit the work site to become familiar with existing conditions which may affect the cost of the project. This includes measurements for lengths, quantities, clearances and all other field verifiable conditions.

B No extra charges will be allowed because of failure of Contractor to become familiar with all existing conditions.

C Where work under this project requires extension, relocation, or modifications to existing equipment, systems or installations the existing equipment, system or installations shall be restored to their original condition, with exception to the work under this project, before completion.

D Existing equipment, systems and installations which are not detailed on the drawings must still be restored to their original condition.

1.6 DRAWINGS

A Drawings indicate the extent and general layout of the electrical systems.

B The electrical drawings are diagrammatic (that is, designed to demonstrate or explain the scope of work), they are intended to be as accurate as planning can determine.

C The scales are shown for estimating purposes only. Field verification of dimensions, locations, and construction details is required. Review appropriate drawings (for example: shop drawings), make field measurements and adjust work to suit the conditions encountered. Although electrical drawings are diagrammatic, they shall be followed as closely as actual construction permits.

D Contractor shall coordinate with civil, architectural, structural, and mechanical construction drawings for locations of partitions, walls, beams, shafts, equipment, etc.

E In general, the drawings of the Electrical Systems and Equipment are to scale, however, to determine exact locations of walls and partitions, the Contractor shall consult the Architectural and/or Structural Drawings which are dimensioned. Drawings shall not take precedence over field measurements. Plans showing circuiting or conduit routing, although shown on scale drawings, are diagrammatic only. They are intended to indicate the size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail or exact arrangement of construction

1. **DO NOT SCALE LOCATIONS OF ELECTRICAL OUTLETS, LIGHT FIXTURES, OR OTHER DEVICES FROM ELECTRICAL DRAWINGS**.
2. Because the drawings are to a relatively small scale to show as large a portion as is practical, the fact that only certain features of the system are indicated does not mean that other similar or different features or details will not be required. The Contractor shall furnish all incidental labor, materials, or equipment for the systems under their control, so that each system is a complete and operating one unless otherwise specifically stipulated in the detailed body of the Specifications.

F The Contractor shall be responsible for determining all field measurements before commencing construction, giving due consideration to building design and other equipment to be installed. Electrical equipment not dimensioned on the drawings shall be field located, giving due consideration to the work of other trades. The Contractor shall verify all dimensions before proceeding with the work. Where cutting and patching is required, each Subcontractor shall be responsible for their own work, unless otherwise determined by the Contractor.

1. If the Contractor discovers any discrepancy between actual measurements and those shown on the drawings which prevents good practice, good arrangement, or which is contrary to the intent of the drawings and specifications, they shall notify the Engineer before proceeding with the work

G Standard electrical symbols along with special symbols are used on all drawings.

1.7 COORDINATION

A If it is found before installation of any or all construction phases, that a more convenient, suitable or workable arrangement of any or all phases of the project would result by varying or altering the arrangement indicated on the drawings, the Engineer may require any or all Contractors to change the location or arrangement of their work without additional cost to the Owner. Such rearrangement shall be in accordance with directions from the Engineer, Architect, Owner, or Consruction Manager.

B Where discrepancies are discovered after certain portions or phases of any Contract have been installed, the Engineer, Architect, Owner, or Construction Manager may direct the Contractor to make minor changes in conduit, outlet, fixture or equipment locations or arrangements to avoid conflict with other work at no additional cost to the Owner. It shall be the responsibility of the Contractor to provide written notification prior to making any changes or performing any additional work described in the plans and specifications. The Contractor may not be compensated for work done before providing notification.

1.8 **QUALITY ASSURANCE**

A Notify the Architect or Engineer of any discrepancies in or omissions from the drawings or documents. Neither theh Owner nor the Architect will be responsible for any oral instructions or modifications of the specifications or drawings. Written interpretations will be made only by Addenda.

B If discrepancies are not reported, the Contractor shall bid the greater quantity or better quality (highest dollar value), and appropriate adjustment will be made after contract award.

C Discrepancies discovered during construction shall immediately be called to the attention of the Architect / Engineer for clarification.

D All minor items necessary for the completion and successful operation of the system, whether or not herin definitely specified or indicated on the drawings, shall be furnished and installed.

E Omission of / or express reference to any material necesssary for / or reasonably incidental to complete installation shall not release Contractor from providing such material. Where material is shown on drawings but is not specified or is specified but not shown, such material shall be considered both shown and specified.

F Any work not clear to Contractor shall be referred to Architect or Engineer for clarification before bid is submitted. If no question is raised prior to opening of bid, Contractor shall be required to provide work in question as directed by Architect or Engineer, whose decision shall be final, without additional charges.

G By virtue of submitting a bid, Contractor agrees they are skilled and experienced in use of and in interpretation of drawings and specifications. Contractor further agrees they have carefully reviewed all drawings, all specifications and all addenda, which constitute bid documents for this contract, and finds them free of ambiguities and good and sufficient for bidding and construction purposes.

H Should major changes from drawings and specification be necessary, Contractor shall provide notification and secure written approval and agreement concerning such changes before work is started.

1.9 WARRANTY

A The Contractor shall be held responsible for any and all defects in equipment and workmanship which appear for one (1) full year after the date of Substantial Completion. All such defects must be repaired or defective equipment promptly replaced by the Contractor at no expense to the Owner..

B The warranty guarantee shall extend one year minimum from the date of final acceptance of the work or for as long as normal equipment manufacturer warranties are in effect from the date of final acceptance of the work.

C During the warranty period, the Electrical Contractor shall respond by making appropriate corrections or repairs required to correct defect within one week of notification. Notification shall be made by telephone, email, or letter.

D The Electrical Contractor shall provide 24-hour service in case of emergency.

1.10 ALTERNATES

A Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement (contract).

B Coordinate related work and modify surrounding work as required.

C Schedule of Alternates: See Division 00 and Division 01.

1.11 UNIT PRICES

A Unit Prices shall include complete compensation for all required labor, products, tools, equipment, incidentals, installation of a piece, portion or item of Work, and overhead and profit.

1. Include the hourly rate for one journeyman electrician to work at the direction of the Architect or Engineer.

1.12 **SUBSTITUTIONS**

A Where substitute materials or prior approved materials are provided, Contractor shall assume all responsibility and pay for all necessary changes resulting from such substitution. This responsibility shall also include any extra costs required by other trades.
1. Provide Products as specified unless substitutions are submitted in this manner and subsequently accepted.

B The listing of any manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any price quotations received and submittals made are for equipment which meet or exceed the specifications included herein.

C Required where specifically noted or where materials are specifically identified by a manufacturer's name, model or catalog number. In these cases only such material may be included in base bid. Prior approval of substitute materials shall be required.

D When a product is considered discontinued by the manufacturer, an equal or better product shall be used instead of the discontinued product, pending engineering approval.

E Prior approved substitutions:
1. Requests for prior approval shall be made in accordance with Division 01, as specified below, and indicated in specific specification section.
2. If Contractor desires to furnish materials other than that named, Contractor or supplier shall apply in writing, to Architect, for prior approval of such material at least ten (10) days prior to bid opening date.
3. Requests for prior approved substitution shall indicate specific proposed materials in lieu of those specified together with complete technical data for all such proposed material.
4. All prior approved substitutions will be clearly identified in addenda which will be sent to all bidders well in advance of bid opening. Only material listed on drawings, specifications and addenda shall be provided.

F Substitutions after execution of contract: Substitution of materials other than those specifically named in contract documents will be approved, by Architect or Engineer, for following reason only:
1. That material proposed for substitution is equal to or superior, in Engineer and Architect's opinion, to that specified in construction, efficiency, appearance, and utility.
2. That material named in the documents cannot be delivered to project in time to complete work due to conditions beyond control of Contractor.

G Equal To and Or Equal: Where materials are specifically identified as “equal to” an identified manufacturer’s name, model, or catalogue numbers or where noted as “or equal” manufacturer’s complying with the requirements of these specifications not listed may be incorporated in the Work. Such materials must be equal to or superior, in Engineer’s opinion, to that specified in construction, efficiency, appearance, and utility.

1.13 DRAWING PLAN BACKGROUNDS AVAILABLE

A Electronic drawing files may be available to the contractor for the purpose of preparing shop drawings or submittals. Files generally available after signing a waiver.

1.14 RECORD DRAWING

A The contractor shall maintain one set of drawings at the job site used as a master copy. Each change order or other revision, deletion, or addition shall be clearly marked and noted by colored pencil. This copy of plans shall be furnished to the Architect upon completion of the project.

B A complete set of these drawings shall be scanned at a resolution of 600dpi in color and saved in an Adobe PDF portfolio format with index to each sheet by name and burned to a non-volatile media. The electronic copy of the as-built drawings shall be transmitted to the Architect. After review and approval by the Architect, the as-built drawings will be turned over to the Owner.

1.15 COOPERATION WITH OTHER TRADES

A Cooperate with other trades so as to avoid interferences. Where required to avoid interferences with other work or to increase the headroom, the Contractor shall off-set and/or re-route the conduit where directed by the Engineer. Carefully check all construction details to assure the proper installation of all work under this specification. Schedule the work such that it will keep pace with the work of other crafts and cause no delay.

B The Contractor shall furnish to other trades, as required, all necessary electrical characteristics, templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.16 PAVEMENT, CURB AND SIDEWALK REPLACEMENT

A This Contractor shall be responsible for replacement of existing street pavement, curbs, and sidewalks, etc., removed or damaged by them during the course of the work, unless such pavement, curbs, sidewalks are to be constructed under the General Contract. The work shall be done in accordance with local requirements.

1.17 SALVAGE

A All items removed from existing building shall be salvaged in a workmanlike manner.

B The handling, storage, and disposition of salvage materials shall be as directed by the Architect. Generally, all salvage material shall remain the property of the Owner. Materials and equipment not wanted by Owner shall be removed from the job site and become the property of the contractor.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 JOBSITE INSPECTIONS

A Periodic job site observations will be made throughout the construction to review applications for payment, observe methods and materials of construction, and review requirements of the Bid Documents.

B Contractor shall notify the Engineer, or authority having jurisdiction, and arrange for observation of installation prior to backfill or concealing of systems. Contractor shall, to the maximum practical extent, schedule work to allow for the observation of systems' installation in groups rather than individually.

C Upon completion of all work, and submittal and approval of Test Reports, Maintenance Manuals and Record Drawings, Contractor shall notify the A/E and shall make arrangements for a Substantial Completion inspection.

D After the inspection is made, the Contractor will receive a list of items requiring adjustment, correction, replacement or completion.

E The Contractor shall promptly comply completely with all the listed requirements. Should the Contractor fail to perform promptly, the Engineer reserves the right to have the work completed by others and the cost deducted from the contract price.

F The Contractor will be billed for projects which are not complete enough for a Substantial Completion Report (Punch List) by the Engineer when one is previously scheduled.

END OF SECTION

SECTION 26 01 20 - ELECTRICAL SHOP DRAWINGS AND SUBMITTALS

PART 1 GENERAL

1.1 SHOP DRAWINGS AND SUBMITTALS

A Each Contractor shall submit to the Architect and/or Engineer, within thirty days after the date of the Contract, electronic sets of shop drawings and/or manufacturer's descriptive literature (coordinate exact requirements with architectural specifications) on all equipment required for the fulfillment of the Contract. Each shop drawing and/or manufacturer's descriptive literature shall have proper notation indicated on it and shall be clearly referenced so the specifications, schedules, light fixture numbers, panel names and numbers, etc., so that the Architect and/or Engineer may readily determine the particular item the Contractor proposes to furnish. All data and information scheduled, noted, or specified by hand shall be noted in color red on the submittals. Make any corrections or changes required and resubmit for final review as requested. Review of such drawings, descriptive literature and/or schedules shall not relieve the Contractor from responsibility for deviation from Drawings or Specifications unless they have, in writing, directed the reviewer's attention to such deviations at the time of submission of drawings, literature and manuals; nor shall it relieve them from responsibility for errors or omissions of any nature in shop drawings, literature and manuals. The term "as specified" will not be accepted.

B If the Contractor fails to comply with the requirements set forth above, the Architect and/or Engineer shall have the option of selecting any or all items listed in the Specifications or on the drawings, and the Contractor will be required to provide all materials in accordance with this list.

C Review of shop drawings by the Engineer applies only to conformance with the design concept of the project and general compliance with the information given in the contract documents. In all cases, the installing Contractor alone shall be responsible for furnishing the proper quantity of equipment and/or materials required, for seeing that all equipment fits the available space in a satisfactory manner and that piping, electrical and all other connections are suitably located.

D The Engineer's review of shop drawings, schedules or other required submittal data shall not relieve the Contractor from responsibility for the adaptability of the equipment or materials to the Project, compliance with applicable codes, rules, regulations, information that pertains to fabrication and installation, dimensions and quantities, electrical characteristics, and coordination of the work with all other trades involved in this Project.

E No cutting, fitting, rough-in, connections, etc., shall be accomplished until “Reviewed” equipment shop drawings are in the hands of the Contractors concerned. It shall be each Contractor's responsibility to obtain “Reviewed” shop drawings and to make all connections, etc. in the neatest and most workmanlike manner possible. Each Contractor shall coordinate with all the other Contractors having any connections, roughing-in, etc., to the equipment, to make certain proper fit, space coordination, voltage and phase relationships are accomplished.

F In accord with the provisions specified hereinbefore, shop drawings, descriptive literature and schedules shall be submitted on each of the following indicated items as well as any equipment or systems deemed necessary by the Engineer:

1. Power Equipment:
    a. Switchboards and panelboards.
    b. Transformers.
    c. Generators.
    d. Automatic transfer switches.
    e. Circuit breakers or fusible switches, per each type.
    f. Power and lighting contactors.
    g. Disconnect switches.
    h. Fuses, per each type required.
    i. Magnetic starters, if not submitted with unit equipment by supplier.
    j. Control components (relays, timers, selector switches, pilots, etc.)

k. Building service grounding electrode components.

2. Raceways:
   a. Conduit (each type).
3. Wireways and each type of wireway fitting.
   a. Surface raceways and fittings.
   b. J-hook assembly.
   c. Junction, pull, and device boxes.
4. Devices:
   a. Building wire, cable splices, and terminations.
   b. Each type of wiring device and their coverplates.
   c. Any special items not listed above.
5. Lighting:
   a. Light fixtures, each by type, marked to indicate all required accessories and lamp selection. Also, provide original color selection chart to allow Architect and/or Engineer to indicate color selection.
   b. Lighting standards or poles.
   c. Photocells, time clocks, contactors or other lighting control devices and accessories.
   d. Control systems (lighting).
6. Miscellaneous
   a. Control panel assemblies.
   b. Non-standard junction/pullboxes.

G Specification Compliance Certification: Where this Section and other Sections of this Division require Specification Compliance Certification to be submitted, comply with the following:

1. Prepare a line-by-line Specification Compliance Certification by marking up a copy of the Contract Document specification section in the left margin. Accompany the markup with a written report explaining all items that are not marked with “Compliance”. Submit line-by-line markup, written report of deviations and alternates and a cover letter certified by Manufacturer or Installer that prepared the Specification Compliance Certification. Use the following key for preparing the line-by-line markup.
   a. “C” for Compliance: By noting the term "compliance" or "C" in the margin, it shall be understood that the manufacturer is in full compliance with the item specified and will provide exactly the same with no deviations.
   b. “D” for Deviation: By noting the term "deviation" or "D" in the margin, it shall be understood that the manufacturer prefers to provide a different component in lieu of that specified.
   c. “A” for Alternate: By noting the term "alternate" or "A" in the margin, it shall be understood that the manufacturer proposes to provide the same operating function but prefers to do it in a different manner.
   d. “N/A” for Not Applicable: By noting the term “not applicable” or “N/A” in the margin, it shall be understood that the specified item is not applicable to the project.

H Provide samples of materials or equipment proposed to be furnished, if requested. Samples shall become the property of the Architect/Engineer and will be returned only when accompanied by a written request to do so.

I None of the items listed shall be purchased, delivered to the site, or installed, until the item is reviewed. No substitution will be permitted after review except where such substitution is considered by the Architect to be in the best interest of the Owner.

J Approval Stamp: This review is to verify general conformance with the design concept of the project and substantial compliance with the information provided in the contract documents. This review does not in any way relieve the Contractor or their suppliers of their responsibility to provide all materials and equipment as specified, in quantities, quality and dimensions required. Submittals will be reviewed with the following actions:

1. “Reviewed” indicates that the Submittal appears to conform to the design concept of the Work and that the Contractor, at their discretion, may proceed with fabrication and/or procurement and installation. Shop drawings that are returned "Reviewed" or "Furnished as Corrected" shall not be resubmitted back to the engineer and if submitted will not be reviewed.
2. “Furnished as Corrected” indicates that the Submittal, after noted corrections are made, appears to conform to the design concept of the Work and that the Contractor, at their discretion, may proceed with fabrication and/or procurement and installation, if the corrections are accepted by the Contractor without any increase in Contract Sum or Time. If the corrections are accepted by the contractor, shop drawings that are returned "Furnished as Corrected" shall not be resubmitted back to the engineer and if submitted will not be reviewed.
3. “Revised and Resubmit” indicates that the noted revisions are such that a corrected copy of the Submittal is required for review to confirm that the noted revisions have been understood and made. The Contractor, at their discretion, may proceed with fabrication and/or procurement and installation after submitting a corrected copy and verifying with the reviewer that the corrected copy is acceptable, if the corrections are accepted by the Contractor without an increase in the Contract Sum or Time.
4. “Rejected” indicates that the Submittal does not appear to conform to the specifications, a resubmission is required, and fabrication or procurement is not authorized.

K If the Engineer rejects (Revised and Resubmit or Rejected) the same section two times the engineer shall be compensated for additional reviews. Contractor is responsible for all delays caused by the resubmittal process.

L Should the contractor fail to comply with any of the requirements of the preceding sub-paragraphs; then the right is reserved by the Architect to select any or all items in the material schedule, with that selection to be final and binding upon the contractor. The materials selected or reviewed, as the case may be, by the Architect, shall be used in the work at no additional cost to the Owner.

1.2 EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

A When any Contractor submits approval of materials and/or equipment of different physical size, weight, capacity, electrical characteristics, function, color, access, it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc.

B In all cases where substitutions or deviations affect other trades, the Contractor requesting or submitting such substitutions shall advise all such Contractors of the change and shall compensate them for all necessary changes in their work. In the event that a substitution or deviation is approved, it is the submitting contractors responsibility to coordinate any changes with the effected subcontractors. Any drawings, specifications, diagram, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense.

1.3 SPECIAL WRENCHES, TOOLS AND KEYS

A Each Contractor shall provide, along with the equipment provided, any special wrenches or tools necessary to dismantle or service equipment or appliances installed by him. Wrenches shall include necessary keys, handles and operators for valves, switches, breakers, etc. and keys to electrical panels, alarm pull boxes and panels, etc. At least two of any such special wrench, keys, etc. shall be turned over to the Architect prior to completion of the project. Obtain a receipt that this has been accomplished and forward a copy to the Engineer.

1.4 EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A Upon Substantial Completion of the Project, the Electrical Contractor shall deliver to the Engineer (in addition to the required Shop Drawings) complete, tabbed, electronic copies of emergency, operation and maintenance instructions and parts lists for all equipment provided. These documents shall at least include:

1. Detailed operating instructions.
2. Detailed maintenance instructions including preventive maintenance schedules.
3. Addresses and phone numbers indicating where parts may be purchased.
4. Reference architectural specifications for additional requirements.

B Refer to individual Contract Document Specification Sections for additional requirements.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A Single conductor building wire.

B Metal-clad cable.

C Variable-frequency drive cable.

D Wiring connectors.

E Electrical tape.

F Heat shrink tubing.

G Oxide inhibiting compound.

H Wire pulling lubricant.

I Cable ties.

1.2 RELATED REQUIREMENTS

A Section 07 84 00 - Firestopping.

B Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).

F ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018 (Reapproved 2023).

G ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

H ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.

I NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

J NECA 104 - Standard for Installing Aluminum Building Wire and Cable; 2012.

K NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

L NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

M NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

N NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O NFPA 79 - Electrical Standard for Industrial Machinery; 2021.

P UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

Q UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

R UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

S UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

T UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

U UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

V UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

W UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

X UL 2277 - Outline of Investigation for Flexible Motor Supply Cable and Wind Turbine Tray Cable; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.6 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

B Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A Provide products that comply with requirements of NFPA 70.

B Provide products listed, classified, and labeled as suitable for the purpose intended.

C Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D Comply with NEMA WC 70.

E Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G Conductors for Grounding and Bonding: Also comply with Section 26 05 26.

H Conductor Material:
1. Provide copper conductors except where aluminum conductors are specifically indicated. Substitution of aluminum conductors for copper is not permitted. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "A" indicate aluminum.
2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.
4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

I Minimum Conductor Size:
1. Branch Circuits: 12 AWG.
   a. Exceptions:
      1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
      3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
2. Control Circuits: 14 AWG.

J Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

K Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
   a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
3. Color Code:
   a. 480Y/277 V, 3 Phase, 4 Wire System:
      1) Phase A: Brown.
      2) Phase B: Purple.
      3) Phase C: Yellow.
      4) Neutral/Grounded: Gray.
   b. 208Y/120 V, 3 Phase, 4 Wire System:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
      4) Neutral/Grounded: White.

c. 240/120 V High-Leg Delta, 3 Phase, 4 Wire System:
   1) Phase A: Black.
   2) Phase B (High-Leg): Orange.
   3) Phase C: Blue.
   4) Neutral/Grounded: White.
d. 240/120 V, 1 Phase, 3 Wire System:
   1) Phase A: Black.
   2) Phase B: Red.
   3) Neutral/Grounded: White.
e. Equipment Ground, All Systems: Green.
f. Isolated Ground, All Systems: Green with yellow stripe.
g. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

2.2 SINGLE CONDUCTOR BUILDING WIRE

A Manufacturers:
1. Copper Building Wire:
   a. Cerro Wire LLC: www.cerrowire.com/#sle.
   b. Encore Wire Corporation: www.encorewire.com/#sle.
   c. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.
   d. Southwire Company: www.southwire.com/#sle.
2. Aluminum Building Wire (only where specifically indicated or permitted for substitution):
   a. Encore Wire Corporation: www.encorewire.com/#sle.
   b. Southwire Company: www.southwire.com/#sle.
   c. Stabiloy, a brand of General Cable Technologies Corporation; _____: www.stabiloy.com/#sle.
   d. Alcan Products Corporation; Alcan Cable Division.

B Description: Single conductor insulated wire.

C Conductor Stranding:
1. Feeders and Branch Circuits:
   a. Size 10 AWG and Smaller: Solid.
   b. Size 8 AWG and Larger: Stranded.

D Insulation Voltage Rating: 600 V.

E Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
   a. Installed Underground: Type XHHW-2.
2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.3 METAL-CLAD CABLE

A Manufacturers:
1. AFC Cable Systems Inc: www.afcweb.com/#sle.
2. Encore Wire Corporation: www.encorewire.com/#sle.
3. Southwire Company: www.southwire.com/#sle.

B Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

D Insulation Voltage Rating: 600 V.

E Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F Provide dedicated neutral conductor for each phase conductor.

G Grounding: Full-size integral equipment grounding conductor.

H Armor: Steel, interlocked tape.

2.4 VARIABLE-FREQUENCY DRIVE CABLE

A Manufacturers:
1. AmerCable.
2. General Cable Corporation.

B Description: Flexible motor supply cable listed and labeled as complying with UL 2277 in accordance with NFPA 79; specifically designed for use with variable frequency drives and associated nonlinear power distortions.

C Conductor Stranding: Stranded.

D Insulation Voltage Rating: 1000 V.

E Insulation: Use only thermoset insulation types; thermoplastic insulation types are not permitted.

F Grounding: Full-size integral equipment grounding conductor or symmetrical arrangement of multiple conductors of equivalent size.

G Provide metallic shielding.

H Jacket: PVC or Chlorinated Polyethylene (CPE).

2.5 WIRING CONNECTORS

A Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use compression connectors.
3. Connectors for Aluminum Conductors: Use compression connectors.

C Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
4. Copper Conductors Size 8 AWG and Larger: Use compression connectors where connectors are required.
5. Aluminum Conductors: Use compression connectors for all connections.

D Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

E Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

F Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

G Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.6 ACCESSORIES

A Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D Wire Pulling Lubricant:
1. Listed and labeled as complying with UL 267.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
3. Suitable for use at installation temperature.

E Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that interior of building has been protected from weather.

B Verify that work likely to damage wire and cable has been completed.

C Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D Verify that field measurements are as indicated.

E Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
5. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:

a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
b. Increase size of conductors as required to account for ampacity derating.
c. Size raceways, boxes, etc. to accommodate conductors.

6. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
7. Provide neutral conductors of the same size as the phase conductor(s) for individual branch circuit homeruns.
8. Provide oversized neutral/grounded conductors where indicated and as specified below.
   a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.
   b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.
9. Provide a neutral conductor at each light switch location controlling line-to-neutral lighting loads.

B Install products in accordance with manufacturer's instructions.

C Perform work in accordance with NECA 1 (general workmanship).

D Install aluminum conductors in accordance with NECA 104.

E Install metal-clad cable (Type MC) in accordance with NECA 120.

F Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
5. Exercise care in handling and installing conductors to avoid damage. Carefully form conductors in equipment pull boxes. Form bends in conductors larger than the minimum radii shown in the cable manufacturer's published data for minimum bends such that bends will not reduce the cable life.
   a. The radius of bending of conductors shall be not less than eighteen (18) times the outside diameter of the conductor insulation.
6. Provide suitable installation equipment to prevent abrasion and cutting of conductors by raceways during the pulling of conductors. Use ropes of polyethylene, nylon or other suitable non-metallic material to pull in feeders. Metallic ropes are prohibited.
7. Attach pulling lines to conductors by means of insulated woven basket grips or by pulling eyes attached directly to conductors. Do not use rope hitches or bare steel basket grips.
8. The pulling of all conductors shall be performed in strict compliance with applicable sections of the National Electrical Code. No conductor entering or leaving a cabinet or box shall be deflected in such a manner as to cause excess pressure on the conductor insulation. Conductors shall only be installed after insulating bushings are in place.
9. Before any conductor is pulled into any conduit, thoroughly swab the conduit to remove all foreign material and to permit the wire itself to be pulled into a clean, dry conduit.

G Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

H Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

I Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
   a. Use listed fittings.

b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

J Variable-Frequency Drive Cable: Terminate shielding at both variable-frequency motor controller and associated motor using glands or termination kits recommended by manufacturer.

K Install conductors with a minimum of 6 inches of slack at each outlet.

L Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

M Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

N Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

O Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
7. Provide temperature ratings of connectors and splices to match conductor rating.

P Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
   a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
   a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
   b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
3. Wet Locations: Use heat shrink tubing.

Q Insulate ends of spare conductors using vinyl insulating electrical tape.

R Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

S Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

T Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

U Run feeders in continuous lengths, without joints or splices. Where continuous runs are impractical, obtain Engineer's approval for splice locations and application.

V Do not use gutters of panelboards as raceways, junction boxes, or pull boxes for conductors not terminating in said panelboard

3.4 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Inspect and test in accordance with NETA ATS, except Section 4.

C Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D Correct deficiencies and replace damaged or defective conductors and cables.

E Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
2. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

F Test Reports: Prepare a written report to record the following:

1. Test procedure used.
2. Test results that comply with requirements.
3. Test results that do no comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Grounding and bonding requirements.

B Conductors for grounding and bonding.

C Connectors for grounding and bonding.

D Ground bars.

E Ground rod electrodes.

F Ground access wells.

1.2 RELATED REQUIREMENTS

A Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B Section 26 05 36 - Cable Trays for Electrical Systems: Additional grounding and bonding requirements for cable tray systems.

C Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

D NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2023.

G UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Verify exact locations of underground metal water service pipe entrances to building.
2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B Sequencing:
1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittals procedures.

B Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C Shop Drawings:
1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.

D Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E Field quality control test reports.

F Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.6 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

B Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A Do not use products for applications other than as permitted by NFPA 70 and product listing.

B Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D Grounding System Resistance:
1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E Grounding Electrode System:
1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
   a. Provide continuous grounding electrode conductors without splice or joint.
   b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
2. Metal Underground Water Pipe(s):
   a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.

b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Metal In-Ground Support Structure:
   a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
4. Concrete-Encased Electrode:
   a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Rod Electrode(s):
   a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
   b. Space electrodes not less than 10 feet from each other and any other ground electrode.
   c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
   d. Provide ground access well for each electrode.
6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
   a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
   b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
   c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
8. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

F Service-Supplied System Grounding:
1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
   a. Transformers (except autotransformers such as buck-boost transformers).
   b. Generators, when neutral is switched in the transfer switch.
2. Provide grounding electrode conductor to connect derived system grounded conductor to common grounding electrode conductor ground riser. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.

4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
5. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
6. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
7. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

H Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor. Where parallel conductors in separate raceways occur, provide an equipment grounding conductor in each raceway that meets requirements of NFPA 70.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
    a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
8. Provide bonding for interior metal air ducts. Provide bonding to duct-mounted electrical devices operating at 120V or more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
9. Provide bonding for each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

I Communications Systems Grounding and Bonding:
1. Provide bonding jumper in raceway from building grounding electrode system to each communications room or backboard and provide ground bar for termination.
    a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
    c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
    d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

J Lightning Protection Systems:
1. Do not use grounding electrode dedicated for lightning protection system for component of building grounding electrode system provided under this section.
2. Provide bonding of building grounding electrode system provided under this section and lightning protection grounding electrode system in accordance with NFPA 70 and NFPA 780.

K Cable Tray Systems: Also comply with Section 26 05 36.

2.2 GROUNDING AND BONDING COMPONENTS

A General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
1. Use insulated copper conductors unless otherwise indicated.
   a. Exceptions:
      1) Use bare copper conductors where installed underground in direct contact with earth.
      2) Use bare copper conductors where directly encased in concrete (not in raceway).

C Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   a. Exceptions:
      1) Use mechanical connectors for connections to electrodes at ground access wells.
3. Unless otherwise indicated, use mechanical connectors or compression connectors for accessible connections.
4. Manufacturers - Mechanical and Compression Connectors:
   a. Burndy LLC; _____: www.burndy.com/#sle.
   b. Harger Lightning & Grounding; _____: www.harger.com/#sle.
   c. nVent ERICO; _____: www.nvent.com/#sle.
   d. Thomas & Betts Corporation; _____: www.tnb.com/#sle.
5. Manufacturers - Exothermic Welded Connections:
   a. Burndy LLC; _____: www.burndy.com/#sle.
   b. nVent ERICO; Cadweld: www.nvent.com/#sle.
   c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC; _____: www.thermoweld.com/#sle.

D Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600V.
2. Size: As indicated. 1/4-inch x 4-inches in cross se
3. Holes for Connections: As indicated or as required for connections to be made.

E Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 5/8 inch diameter by 8 feet length, unless otherwise indicated.

F Ground Access Wells:
1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
   a. Round Wells: Not less than 8 inches in diameter.
   b. Rectangular Wells: Not less than 12 by 12 inches.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
4. Cover: Factory-identified by permanent means with word "GROUND".

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that work likely to damage grounding and bonding system components has been completed.

B Verify that field measurements are as indicated.

C Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Install products in accordance with manufacturer's instructions.

B Perform work in accordance with NECA 1 (general workmanship).

C Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.

D Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E Identify grounding and bonding system components in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Inspect and test in accordance with NETA ATS except Section 4.

C Perform inspections and tests listed in NETA ATS, Section 7.13.

D Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

C Section 26 05 36 - Cable Trays for Electrical Systems: Additional support and attachment requirements for cable tray.

D Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

E Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

F Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.3 REFERENCE STANDARDS

A ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D MFMA-4 - Metal Framing Standards Publication; 2004.

E NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
2. Coordinate work to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 30 00.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittal procedures.

B Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

C Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

1.6 QUALITY ASSURANCE

A Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A General Requirements:
1. Comply with the following. Where requirements differ, comply with most stringent.
   a. NFPA 70.
   b. Applicable building code.
   c. Requirements of authorities having jurisdiction.
2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of 5. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
   a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
   c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
1. Manufacturers:
   a. ABB: www.electrification.us.abb.com/#sle.
   b. Eaton Corporation: www.eaton.com/#sle.
   c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
   d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
   e. nVent; Caddy: www.nvent.com/#sle.
2. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
3. Conduit Clamps: Bolted type unless otherwise indicated.

C Outlet Box Supports: Hangers and brackets suitable for boxes to be supported. Factory-fabricated sheet steel brackets for support of device boxes adjacent to or between studs.
1. Manufacturers:

a. ABB: www.electrification.us.abb.com/#sle.
b. Eaton Corporation: www.eaton.com/#sle.
c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
e. nVent; Caddy: www.nvent.com/#sle.

D Metal Channel/Strut Framing Systems:
1. Manufacturers:
   a. ABB: www.electrification.us.abb.com/#sle.
   b. Atkore International Inc; Unistrut: www.unistrut.us/#sle.
   c. Eaton Corporation: www.eaton.com/#sle.
   d. Source Limitations: Furnish channel/strut and associated fittings, accessories, and hardware produced by single manufacturer.
2. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
3. Comply with MFMA-4.
4. Channel Material:
   a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

E Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
   a. Equipment Supports: 1/2-inch diameter.
   b. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
   c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
   d. Trapeze Support for Multiple Conduits: 3/8-inch diameter.
   e. Outlet Boxes: 1/4-inch diameter.
   f. Luminaires: 1/4-inch diameter.

F Anchors and Fasteners:
1. Manufacturers - Mechanical Anchors:
   a. Dewalt: anchors.dewalt.com/#sle.
   b. Hilti, Inc: www.hilti.com/#sle.
   c. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.
   d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.
2. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
4. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
5. Hollow Masonry: Use toggle bolts.
6. Hollow Stud Walls: Use toggle bolts.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners are not permitted.
11. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
    b. Comply with MFMA-4.
    c. Channel Material: Use galvanized steel.
    d. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that mounting surfaces are ready to receive support and attachment components.

C Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Install products in accordance with manufacturer's instructions.

B Install hangers and supports in accordance with NECA 1.

C Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G Equipment Support and Attachment:
1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 4 inches in height; see Section 03 30 00.
5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H Conduit Support and Attachment: See Section 26 05 33.13 for additional requirements.

I Cable Tray Support and Attachment: See Section 26 05 36 for additional requirements.

J Box Support and Attachment: See Section 26 05 33.16 for additional requirements.

K Interior Luminaire Support and Attachment: See Section 26 51 00 for additional requirements.

L Exterior Luminaire Support and Attachment: See Section 26 56 00 for additional requirements.

M Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

N Secure fasteners in accordance with manufacturer's recommended torque settings.

O Remove temporary supports.

P Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

Q No conduit, supports, etc. shall be run through access clearances of equipment by other trades. Coordinate with all trades prior to construction.

3.3 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements for additional requirements.

B Inspect support and attachment components for damage and defects.

C Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Galvanized steel rigid metal conduit (RMC).

B Aluminum rigid metal conduit (RMC).

C PVC-coated galvanized steel rigid metal conduit (RMC).

D Flexible metal conduit (FMC).

E Liquidtight flexible metal conduit (LFMC).

F Galvanized steel electrical metallic tubing (EMT).

G Aluminum electrical metallic tubing (EMT).

H Rigid polyvinyl chloride (PVC) conduit.

I Electrical nonmetallic tubing (ENT).

1.2 RELATED REQUIREMENTS

A Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.

B Section 07 84 00 - Firestopping.

C Section 26 05 26 - Grounding and Bonding for Electrical Systems.
1. Includes additional requirements for fittings for grounding and bonding.

D Section 26 05 29 - Hangers and Supports for Electrical Systems.

E Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F Section 31 23 16 - Excavation.

G Section 31 23 23 - Fill: Bedding and backfilling.

1.3 REFERENCE STANDARDS

A ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A); 2020.

D NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

F NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

G NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

H NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.

I NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

J NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

K NEMA BI 50058 - Electrical Nonmetallic Tubing (ENT); 2014 (Reaffirmed 2019).

L NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

N UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

O UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

P UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

Q UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

R UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

S UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

T UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

U UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

V UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.

W UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B Sequencing:
1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittals procedures.

B Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C Shop Drawings:
1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.

D Project Record Documents: Record actual routing for conduits installed underground and conduits embedded within concrete slabs.

1.6 QUALITY ASSURANCE

A Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C Underground:
1. Under Slab on Grade: Use rigid PVC conduit.
2. Exterior, Direct-Buried: Use PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit.
3. Exterior, Embedded Within Concrete: Use rigid PVC conduit.
4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to PVC-coated galvanized steel rigid metal conduit (RMC) where emerging from underground.
5. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape or factory-applied corrosion protection coating acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
6. Where galvanized steel electrical metallic tubing (EMT) is installed in direct contact with earth, use corrosion protection tape or factory-applied corrosion protection coating acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

D Embedded Within Concrete:
1. Within Slab on Grade: Use PVC-coated galvanized steel rigid metal conduit (RMC) or rigid PVC conduit. Embed within structural slabs only where approved by Structural Engineer. Where approved, only branch circuits shall be routed within slab. Feeders shall not be routed within slab.
2. Within Slab Above Ground: Not permitted.
3. Where rigid polyvinyl (PVC) conduit is provided, transition to PVC-coated galvanized steel rigid metal conduit (RMC) where emerging from concrete.

E Concealed Within Masonry Walls: Use galvanized steel electrical metallic tubing (EMT).

F Concealed Within Hollow Stud Walls: Use galvanized steel electrical metallic tubing (EMT).

G Concealed Above Accessible Ceilings: Use galvanized steel electrical metallic tubing (EMT).

H Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC).

I Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel electrical metallic tubing (EMT).

J Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC).
1. Locations subject to physical damage include, but are not limited to:
   a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

K Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC) or aluminum rigid metal conduit (RMC).

L Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC).

M Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel electrical metallic tubing (EMT) or aluminum electrical metallic tubing (EMT).

N Corrosive Locations Above Ground: Use PVC-coated galvanized steel rigid metal conduit (RMC).

1. Corrosive locations include, but are not limited to:
   a. Cooling towers.
   b. Marine environments.
   c. Chemical storage areas.

O Flexible Connections to Vibrating Equipment:
1. Dry Locations: Use flexible metal conduit (FMC).
2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
3. Maximum Length: 6 feet unless otherwise indicated.
4. Vibrating equipment includes, but is not limited to:
   a. Transformers.
   b. Motors.

2.2 CONDUIT - GENERAL REQUIREMENTS

A Comply with NFPA 70.

B Fittings for Grounding and Bonding: See Section 26 05 26 for additional requirements.

C Provide conduit, fittings, supports, and accessories required for complete raceway system.

D Provide products listed, classified, and labeled as suitable for purpose intended.

E Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 3/4-inch trade size.
2. Branch Circuit Homeruns: 3/4-inch trade size.
3. Control Circuits: 1/2-inch trade size.
4. Underground, Interior: 1-inch trade size.
5. Underground, Exterior: 1-inch trade size.

F Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular.com/#sle.
3. Rymco USA: www.rymcousa.com/#sle.
4. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
5. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

B Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
2. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.4 ALUMINUM RIGID METAL CONDUIT (RMC)

A Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular.com/#sle.

3. Rymco USA: www.rymcousa.com/#sle.
4. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
5. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

B Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.

C Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
2. Material: Use aluminum.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.5 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A Manufacturers:
1. ABB; Ocal: www.electrification.us.abb.com/#sle.
2. Calbond, a division of Atkore International www.calbond.com/#sle
3. Robroy Industries: www.robroy.com/#sle.

B Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

C Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

D PVC-Coated Boxes and Fittings:
1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
3. Material: Use steel or malleable iron.
4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.

E PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

2.6 FLEXIBLE METAL CONDUIT (FMC)

A Manufacturers:
1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.

B Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

C Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.7 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A Manufacturers:
1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.

B Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.8 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular/#sle.
3. Rymco USA: www.rymcousa.com/#sle.
4. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
5. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

B Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression/gland or set-screw type.
   a. Do not use indenter type connectors and couplings.
4. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.

2.9 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)

A Manufacturers:
1. American Conduit, a division of Hydro: www.americanconduit.com/#sle.

B Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.

C Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
2. Material: Use aluminum.
3. Connectors and Couplings: Use compression/gland or set-screw type.
   a. Do not use indenter type connectors and couplings.

2.10 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A Manufacturers:
1. ABB; Carlon: www.carlon.com/#sle.
2. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
3. Cantex Inc: www.cantexinc.com/#sle.
4. Heritage Plastics, a division of Atkore International: www.heritageplastics.com/#sle.
5. JM Eagle: www.jmeagle.com/#sle.

B Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.11 ELECTRICAL NONMETALLIC TUBING (ENT)

A Manufacturers:
1. ABB; Carlon: www.electrification.us.abb.com/#sle.
2. Cantex Inc: www.cantexinc.com/#sle.
3. IPEX, a division of Aliaxis: ww.ipexna.com/#sle.

B Description: NFPA 70, Type ENT electrical nonmetallic tubing complying with NEMA BI 50058 and listed and labeled as complying with UL 1653.

C Fittings:
1. Manufacturer: Same as manufacturer of ENT to be connected.
2. Use solvent-welded type fittings.
3. Solvent-Welded Fittings: Rigid PVC fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; suitable for use with ENT.

2.12 ACCESSORIES

A Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

B Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

E Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.

F Sealing Systems for Concrete Penetrations:
1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

G Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

H Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

I Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

J Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for both direct bury and concrete encasement in open trench installation; suitable for conduit/duct arrangement to be installed.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that mounting surfaces are ready to receive conduits.

C Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Install products in accordance with manufacturer's instructions.

B Install conduit in accordance with NECA 1.

C Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.

E Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by manufacturer.

F Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

G Install electrical nonmetallic tubing (ENT) in accordance with NECA 111.

H Conduit Routing:
1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
   a. Electrical rooms.
   b. Mechanical equipment rooms.
   c. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route exposed conduits:
   a. Across floors.
   b. Across roofs.
   c. Across top of parapet walls.
   d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than equivalent of three 90-degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
   a. Heaters.
   b. Hot water piping.
   c. Flues.
14. Group parallel conduits in same area on common rack.

I Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
   a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.

8. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
9. Use of spring steel conduit clips for support of conduits is permitted only as follows:
    a. Support of electrical metallic tubing (EMT) up to 1-inch (27 mm) trade size concealed above accessible ceilings and within hollow stud walls.
10. Use of wire for support of conduits is not permitted.
11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

J Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
8. Secure joints and connections to provide mechanical strength and electrical continuity.

K Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
8. Provide metal escutcheon plates for conduit penetrations exposed to public view.
9. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 84 00.

L Underground Installation:
1. Provide trenching and backfilling; see Section 31 23 16 and Section 31 23 23 in addition to this Section.
2. Minimum Cover, Unless Otherwise Indicated or Required:
    a. Underground, Exterior: 36 inches.
    b. Under Slab on Grade: 12 inches to bottom of slab.
3. Provide underground detectable warning tape along entire conduit length; see Section 26 05 53.
4. For multiple conduit runs in an underground trench, provide conduit duct bank spacer support rack to evenly space out and support the conduits in an orderly manner in the trench.

M Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Maximum Conduit Size: 1-inch trade size unless otherwise approved.
2. Install conduits within middle one third of slab thickness.
3. Secure conduits to prevent floating or movement during pouring of concrete.

N Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 03 30 00.

O Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

P Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
   a. Where conduits enter building from outside.
   b. Where service conduits enter building from underground distribution system.
   c. Where conduits enter building from underground.
   d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
   a. Where conduits pass from outdoors into conditioned interior spaces.
   b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
   c. Where conduits penetrate coolers or freezers.
3. Where conduits cross boundaries of hazardous/classified locations, provide identified/listed sealing fittings or conduit mechanical seals as approved by authorities having jurisdiction; locate as indicated or in accordance with NFPA 70.

Q Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

R Provide grounding and bonding; see Section 26 05 26.

3.3 EXCAVATION FOR TRENCHES FOR ELECTRICAL DUCT BANKS

A Excavate trenches to indicated gradients, lines, depths, and elevations.

B Excavate trenches to uniform widths to provide a minimum 3-inch clearance on each side of conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of conduit unless otherwise indicated.

C Trench Bottoms: Excavate trenches 4 inches deeper than bottom of conduit elevations to allow for conduit support rack.
1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.4 ELECTRICAL TRENCH BACKFILL FOR DIRECT-BURY DUCT BANK

A Place backfill on subgrades free of mud, frost, snow, or ice but not before completing the following.
1. Testing and inspecting underground conduits.
2. Removing trash and debris.

B Place and compact initial backfill of bed sand or subbase material in 6 inch lifts, free of particles larger than 1 inch in any dimension, from base of trench to 12 inches above top of conduit.
1. Carefully compact initial backfill under conduits and compact evenly up on both sides and along the full length of conduit to avoid damage or displacement of conduit. Coordinate backfilling with utilities testing.

C Place and compact bedding course on trench bottoms. Shape bedding course to provide continuous support for joints, fittings, and bodies of conduits.

D Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil.

E Backfill remaining trench void with satisfactory soil to match grade while removing shoring and bracing.

F Place underground detectable warning tape in trench at 18 inches below top of finished grade.

3.5 ELECTRICAL TRENCH BACKFILL FOR CONCRETE ENCASED DUCT BANK

A Place backfill on subgrades free of mud, frost, snow, or ice but not before completing the following.
1. Testing and inspecting underground conduits.
2. Removing trash and debris.

B Place concrete encasement around conduit duct bank from base of trench to 3 inches above top of conduit ductbank.

C Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil.

D Backfill remaining trench void above concrete encasement with satisfactory soil to match grade while removing shoring and bracing.

E Place underground detectable warning tape in trench at 18 inches below top of finished grade.

3.6 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements for additional requirements.

B Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D Correct deficiencies and replace damaged or defective conduits.

3.7 CLEANING

A Clean interior of conduits to remove moisture and foreign matter.

3.8 PROTECTION

A Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 26 05 33.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C Floor boxes.

D Underground boxes/enclosures.

1.2 RELATED REQUIREMENTS

A Section 03 30 00 - Cast-in-Place Concrete.

B Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

C Section 26 05 29 - Hangers and Supports for Electrical Systems.

D Section 26 05 33.13 - Conduit for Electrical Systems:
1. Conduit bodies and other fittings.
2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

E Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F Section 26 27 26 - Wiring Devices:
1. Wall plates.
2. Floor box service fittings.
3. Additional requirements for locating boxes for wiring devices.

G Section 27 10 00 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.3 REFERENCE STANDARDS

A NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G SCTE 77 - Specifications for Underground Enclosure Integrity; 2017.

H UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.

C Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D Project Record Documents: Record actual locations for pull boxes, floor boxes, and underground boxes/enclosures.

E Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Keys for Lockable Enclosures: Two of each different key.

1.6 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 BOXES

A General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
    c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
13. Wall Plates: Comply with Section 26 27 26.

C Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
6. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
    c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.

D Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
2. Use cast iron floor boxes within slab on grade.
3. Use sheet-steel or cast iron floor boxes within slab above grade.
4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
5. Manufacturer: Same as manufacturer of floor box service fittings.

E Underground Boxes/Enclosures:

1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As indicated on drawings.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
4. Applications:
   a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
   b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.
   c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
   a. Manufacturers:
      1) Hubbell Incorporated; Quazite Products: www.hubbellpowersystems.com/#sle.
      2) MacLean Highline: www.macleanhighline.com/#sle.
      3) Oldcastle Precast, Inc: www.oldcastleprecast.com/#sle.
   b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that mounting surfaces are ready to receive boxes.

C Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Install products in accordance with manufacturer's instructions.

B Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D Provide separate boxes for emergency power and normal power systems.

E Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G Box Locations:
1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
2. Locate boxes as required for devices installed under other sections or by others.
   a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
   b. Communications Systems Outlets: Comply with Section 27 10 00.
3. Locate boxes so that wall plates do not span different building finishes.
4. Locate boxes so that wall plates do not cross masonry joints.
5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
7. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.

a. Where boxes are located in the same vertical channel/stud space on opposite sides of the same wall, provide sound insulating putty around boxes as required to eliminate sound transmission from room to room.

8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
   a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
10. Locate junction and pull boxes in the following areas, unless otherwise indicated:
    a. Concealed above accessible suspended ceilings. Locate no more than 36 inches above ceiling level. Label each box in area of work with a permanent marker.
    b. Within joists in areas with no ceiling.
    c. Electrical rooms.
    d. Mechanical equipment rooms.

H Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

I Install boxes plumb and level.

J Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

K Floor-Mounted Cabinets: Mount on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

L Install boxes as required to preserve insulation integrity.

M Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

N Underground Boxes/Enclosures:
1. Install enclosure on gravel base, minimum 6 inches deep.
2. Flush-mount enclosures located in concrete or paved areas.
3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

O Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

P Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

Q Close unused box openings.

R Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

S Provide grounding and bonding in accordance with Section 26 05 26.

T Identify boxes in accordance with Section 26 05 53.

3.3 CLEANING

A Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.4 PROTECTION

A Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Electrical identification requirements.

B Identification nameplates and labels.

C Wire and cable markers.

D Voltage markers.

E Underground warning tape.

F Floor marking tape.

G Warning signs and labels.

1.2 RELATED REQUIREMENTS

A Section 09 91 13 - Exterior Painting.

B Section 09 91 23 - Interior Painting.

C Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

D Section 26 05 73 - Power System Studies: Arc flash hazard warning labels.

E Section 26 27 26 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

1.3 REFERENCE STANDARDS

A NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B Sequencing:
1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements for submittals procedures.

B Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

1.6 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    a. Switchboards:
        1) Identify ampere rating.
        2) Identify voltage and phase.
        3) Identify power source and circuit number. Include location when not within sight of equipment.
        4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
    b. Panelboards:
        1) Identify ampere rating.
        2) Identify voltage and phase.
        3) Identify power source and circuit number. Include location when not within sight of equipment.
        4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces.
        5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
    c. Transformers:
        1) Identify kVA rating.
        2) Identify voltage and phase for primary and secondary.
        3) Identify power source and circuit number. Include location when not within sight of equipment.
    d. Enclosed switches, circuit breakers, and motor controllers:
        1) Identify voltage and phase.
        2) Identify power source and circuit number. Include location when not within sight of equipment.
        3) Identify load(s) served. Include location when not within sight of equipment.
    e. Time Switches:
        1) Identify load(s) served and associated circuits controlled. Include location.
    f. Centralized Emergency Lighting Inverters:
        1) Identify input and output voltage and phase.
        2) Identify power source and circuit number for normal power source. Include location when not within sight of equipment.
        3) Identify load(s) served. Include location.
    g. Transfer Switches:
        1) Identify voltage and phase.
        2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
        3) Identify load(s) served. Include location when not within sight of equipment.
        4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
2. Service Equipment:
    a. Use identification nameplate to identify each service disconnecting means.
    b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.

3. Emergency System Equipment:
   a. Use identification nameplate to identify emergency system equipment in accordance with NFPA 70.
   b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
4. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
5. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
6. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
7. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
   a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 91 23 and 09 91 13.
8. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
   a. Service equipment.
   b. Industrial control panels.
   c. Motor control centers.
   d. Elevator control panels.
   e. Industrial machinery.
9. Arc Flash Hazard Warning Labels: Comply with Section 26 05 73.
10. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.

B Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
2. Use identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
   a. Within boxes when more than one circuit is present.

C Identification for Raceways:
1. Use color-coded bands or factory-painted conduits to identify systems other than normal power system for accessible conduits.
   a. Maximum Intervals: 20 feet.
   b. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
      1) Field-Painting: Comply with Section 09 91 23 and 09 91 13.
      2) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19.
   c. Color Code:
      1) Emergency Power System: Red.
      2) Fire Alarm System: Red.
2. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
3. Use underground warning tape to identify underground raceways.

D Identification for Boxes:
1. Use voltage markers or color coded boxes to identify systems other than normal power system.
   a. Color-Coded Boxes: Field-painted in accordance with Section 09 91 23 and 09 91 13 per the same color code used for raceways.
   b. For exposed boxes in public areas, do not color code.
2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
   a. For exposed boxes in public areas, use only identification labels.

E Identification for Devices:
1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
2. Use identification label to identify fire alarm system devices.
   a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles. For devices located within 6-foot of sink or water source, use engraved wallplate.
   a. For receptacles ans in public areas, provide identification on inside surface of wallplate.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A Identification Nameplates:
1. Materials:
   a. Indoor Clean, Dry Locations: Use plastic nameplates.
   b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   a. Use only for indoor locations.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C Format for Equipment Identification:
1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
   a. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
   a. Equipment Designation: 1/2 inch.
   b. Other Information: 1/4 inch.
   c. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.
5. Color:
   a. Normal Power System: White text on black background.
   b. Emergency Power System: White text on red background.

D Format for General Information and Operating Instructions:
1. Minimum Size: 2 inches by 4 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.

3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch.
5. Color: Black text on white background unless otherwise indicated.

E Format for Caution and Warning Messages:
1. Minimum Size: 2 inches by 4 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch.
5. Color: Black text on yellow background unless otherwise indicated.

F Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

2.3 WIRE AND CABLE MARKERS

A Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, or plastic sleeve type markers suitable for the conductor or cable to be identified.

B Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C Legend: Power source and circuit number or other designation indicated.

D Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E Minimum Text Height: 1/8 inch.

F Color: Black text on white background unless otherwise indicated.

2.4 VOLTAGE MARKERS

A Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

B Minimum Size:
1. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
2. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

C Legend:
1. Markers for System Identification:
   a. Emergency Power System: Text "EMERGENCY".
   b. Other Systems: Type of service.

D Color: Black text on orange background unless otherwise indicated.

2.5 UNDERGROUND WARNING TAPE

A Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

C Legend: Type of service, continuously repeated over full length of tape.

D Color:

1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.6 FLOOR MARKING TAPE

A Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.

2.7 WARNING SIGNS AND LABELS

A Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B Warning Signs:
1. Materials:
   a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
   b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
3. Minimum Size: 7 by 10 inches unless otherwise indicated.

C Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

A Install products in accordance with manufacturer's instructions.

B Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Branch Devices: Adjacent to device.
6. Interior Components: Legible from the point of access.
7. Conduits: Legible from the floor.
8. Boxes: Outside face of cover.
9. Conductors and Cables: Legible from the point of access.
10. Devices: Outside face of cover.

C Install identification products centered, level, and parallel with lines of item being identified.

D Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F Install underground warning tape above buried lines with a minimum of one tape per trench at 18 inch(es) below finished grade.

G Secure rigid signs using stainless steel screws.

H Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 26 05 73 - POWER SYSTEM STUDIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A Short-circuit study.

B Protective device coordination study.

C Arc flash and shock risk assessment.
1. Includes arc flash hazard warning labels.

D Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.2 RELATED REQUIREMENTS

A Section 26 05 53 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

B Section 26 21 00 - Low-Voltage Electrical Service Entrance.
1. Includes Utility Company contact information.

1.3 REFERENCE STANDARDS

A ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

B IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

C IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

D IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

E IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

F IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).

G NEMA MG 00001 - Motors and Generators; 2024.

H NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

I NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B Sequencing:
1. Submit study reports prior to or concurrent with product submittals.
2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Study reports, stamped or sealed and signed by study preparer.

C Site-specific arc flash hazard warning labels.

D Field quality control reports.

E Certification that field adjustable protective devices have been set in accordance with requirements of studies.

F Project Record Documents: Revise studies as required to reflect as-built conditions.
1. Include hard copies with operation and maintenance data submittals.
2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

1.6 POWER SYSTEM STUDIES

A Scope of Studies:
1. Perform analysis of new electrical distribution system as indicated on drawings.
2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
3. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.
   a. Known Operating Modes:
      1) Utility as source.
      2) Generator as source.

B General Study Requirements:
1. Comply with NFPA 70.
2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C Data Collection:
1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
   a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
      1) Obtain up-to-date information from Utility Company.
      2) Utility Company: See Section 26 21 00 for Utility Company contact information.
   b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.
   c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 00001 code letter designation.
   d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
   e. Protective Devices:
      1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
      2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
   f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.

g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D Short-Circuit Study:
1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
   a. Maximum utility fault currents.
   b. Maximum motor contribution.
   c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E Protective Device Coordination Study:
1. Comply with applicable portions of IEEE 242 and IEEE 399.
2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. Analyze protective devices and associated settings for suitable margins between time-current curves to provide adequate protection for equipment and conductors while achieving selective coordination for fault durations extending beyond 0.1 seconds. full selective coordination for Life Safety loads and selective coordination for fault durations extending beyond 0.1 seconds for Optional Standby loads.

F Arc Flash and Shock Risk Assessment:
1. Comply with NFPA 70E.
2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
   a. Where reasonable, study preparer may assume a maximum clearing time of two seconds in accordance with IEEE 1584, provided that the conditions are such that a worker's egress from an arc flash event would not be inhibited.
   b. For single-phase systems, study preparer to perform calculations assuming three-phase system in accordance with IEEE 1584 using single phase bolted fault current, yielding conservative results.
3. For equipment with main devices mounted in separate compartmentalized sections, perform calculations on both the line and load side of the main device.
4. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
   a. Maximum and minimum utility fault currents.
   b. Maximum and minimum motor contribution.
   c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

G Study Reports:
1. General Requirements:
   a. Identify date of study and study preparer.
   b. Identify study methodology and software product(s) used.
   c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
   d. Identify base used for per unit values.
   e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
   f. Include conclusions and recommendations.
2. Short-Circuit Study:
   a. For each scenario, identify at each bus location:

1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
2) Fault point X/R ratio.
3) Associated equipment short circuit current ratings.

b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.

3. Protective Device Coordination Study:
   a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
   b. For each graph include (where applicable):
      1) Partial single-line diagram identifying the portion of the system illustrated.
      2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
      3) Conductors: Damage curves.
      4) Transformers: Inrush points and damage curves.
      5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
      6) Motors: Full load current, starting curves, and damage curves.
      7) Capacitors: Full load current and damage curves.
   c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
      1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
      2) Include ground fault pickup and delay.
      3) Include fuse ratings.
      4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.
   d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.
4. Arc Flash and Shock Risk Assessment:
   a. For the worst case for each scenario, identify at each bus location:
      1) Calculated incident energy and associated working distance.
      2) Calculated arc flash boundary.
      3) Bolted fault current.
      4) Arcing fault current.
      5) Clearing time.
      6) Arc gap distance.
   b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.
   c. Include recommendations for reducing the incident energy at locations where the calculated maximum incident energy exceeds 8 calories per sq cm.

1.7 QUALITY ASSURANCE

A Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.
1. Study preparer may be employed by manufacturer of electrical distribution equipment.
2. Study preparer may be employed by field testing agency.

B Field Testing Agency Qualifications: Independent testing organization specializing in testing, analysis, and maintenance of electrical systems with minimum five years experience; NETA Accredited Company.

C Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.
1. Products:
a. SKM Systems Analysis, Inc: www.skm.com/#sle.

PART 2 PRODUCTS

2.1 ARC FLASH HAZARD WARNING LABELS

A Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
1. Materials: Comply with Section 26 05 53.
2. Minimum Size: 4 by 6 inches.
3. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
a. Include orange header that reads "WARNING" unless otherwise indicated.
b. Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.
c. Include the following information:
1) Arc flash boundary.
2) Available incident energy and corresponding working distance.
3) Nominal system voltage.

PART 3 EXECUTION

3.1 INSTALLATION

A Install arc flash warning labels in accordance with Section 26 05 53.

3.2 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Provide the services of field testing agency or equipment manufacturer's representative to perform inspection, testing, and adjusting.

C Inspect and test in accordance with NETA ATS, except Section 4.

D Adjust equipment and protective devices for compliance with studies and recommended settings.

E Notify Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.

F Submit detailed reports indicating inspection and testing results, and final adjusted settings.

3.3 CLOSEOUT ACTIVITIES

A See Section 01 78 00 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 26 08 00 - COMMISSIONING OF ELECTRICAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A ASHRAE Guideline 1 – 1996.

B ASHRAE Guideline 0 – 2005.

C ACG Commissioning Guideline – 2005.

1.2 SUMMARY

A Section includes commissioning process requirements for electrical systems, assemblies, and equipment.

B Related Sections:

1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.3 DESCRIPTION OF WORK

A The purpose of the commissioning process is to provide the Owner of the facility with a high level of assurance that the mechanical systems have been installed in the prescribed manner, and operate within the performance guidelines set in the Basis of Design Documents (BOD). The CA shall provide the owner with an unbiased, objective view of the system's installation, operation, and performance. This process is not intended to take away or reduce the responsibility of the design team or installing contractors to provide a finished product. Commissioning is intended to enhance the quality of system start-up and aid in the orderly transfer of systems for beneficial use by the owner. The CA will be a member of the construction team, administrating and coordinating commissioning activities with the design team, construction manager, subcontractors, manufacturers and equipment suppliers.

B The independent commissioning agent (CA) contracted directly with the owner for this project. This specification has been included for reference only to define contractors' responsibilities. Each contractor should review this procedure and include adequate time in their proposal.

1.4 DEFINITIONS

A Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B CxA: Commissioning Authority.

C Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.5 INFORMATIONAL SUBMITTALS

A Certificates of readiness.

B Certificates of completion of installation, prestart, and startup activities.

1.6 ALLOWANCES

A Labor, instrumentation, tools, and equipment costs for technicians for the performance of commissioning testing are covered by the "Schedule of Allowances" Article in Division 01 Section "Allowances."

1.7 UNIT PRICES

A Commissioning testing allowance may be adjusted up or down by the "List of Unit Prices" Article in Division 01 Section "Unit Prices" when actual man-hours are computed at the end of commissioning testing.

1.8 CONTRACTOR'S RESPONSIBILITIES

A Electrical commissioning is primarily the responsibility of the Division 26 subcontractor, but is led under the direction, guidance, and approval of the CxA. Division 26 subcontractor shall take the lead responsibility for the following:
1. Inspecting, completing, and documenting the Pre-Functional Testing for the electrical systems to ensure the systems are fully operational and ready for Functional Testing.
2. Demonstrating the operations of the electrical systems for Functional Testing.

B Participate in commissioning of HVAC&R systems and HVAC&R Instrumentation and Controls Systems as requested by CxA.

C Provide information requested by the CxA for final commissioning documentation.

D Provide measuring instruments and logging devices to record test data and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.9 CXA'S RESPONSIBILITIES

A Provide Project-specific construction checklists and commissioning process test procedures for actual electrical systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

B Direct commissioning testing.

C Verify testing and adjusting of Work are complete.

D Provide test data, inspection reports, and certificates in Systems Manual.

1.10 COMMISSIONING DOCUMENTATION

A Provide the following information to the CxA for inclusion in the commissioning plan:
1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for electrical systems, assemblies, equipment, and components to be verified and tested.
4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
5. Test and inspection reports and certificates.
6. Corrective action documents.

1.11 SCHEDULING

A Commissioning shall comply with the Construction Contract schedule. Cooperate with the CxA in the following manner:
1. Allow sufficient time before final completion dates so that test and balance and commissioning testing can be accomplished.
2. Provide labor and material to make corrections when required without undue delay.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A Provide all necessary test equipment to confirm proper operation of the Electrical Systems.

B All testing equipment shall be properly calibrated and documentation of such calibration shall be submitted prior to any verification testing.

PART 3 EXECUTION

3.1 TESTING PREPARATION

A The CxA shall provide the Pre-Functional checklists and Functional Testing forms.

B Certify that electrical systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

C Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

D Inspect and verify the position of each device and interlock identified on checklists.

E Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.2 GENERAL TESTING REQUIREMENTS

A Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA. These technicians shall be made available to assist the CxA in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, time required for testing, etc., will be requested by the CxA and coordinated by the subcontractor. The subcontractor shall ensure the qualified technician(s) are available and present during the agreed upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B The Division 26 subcontractor shall take the lead in commissioning of the following Electrical Systems:
1. Lighting Control System.
2. Emergency Generator.

C Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D Tests will be performed using design conditions whenever possible.

E Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

F The CxA may direct that set points be altered when simulating conditions is not practical.

G The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

H If tests cannot be completed because of a deficiency outside the scope of the electrical system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

I System problems and discrepancies may require additional technician time, CxA time, redesign and/or reconstruction of systems, and system components. The additional technician time shall be made available for the subsequent commissioning periods until the required system performance is obtained.

J Complete Start-Up, Pre-Functional Testing, and Functional Testing documentation for the Electrical Systems. Submit completed test forms to the CxA.

3.3 PRE-FUNCTIONAL CHECKLISTS

A After the initial equipment submittal phase, the CxA shall prepare Pre-Functional Test forms for each item of equipment as part of the commissioning. Review respective Pre-Functional Test forms for accuracy and completeness and provide comments to the General Contractor and CxA.

3.4 FUNCTIONAL TEST FORMS

A After the finalization of the Pre-Functional Test forms, the CxA shall prepare Functional Test forms for each system to be documented as part of the commissioning. Review respective Functional Test forms for accuracy and completeness and provide comments to the General Contractor and CxA.

END OF SECTION

SECTION 26 09 43 - LIGHTING CONTROL SYSTEM

PART 1 – GENERAL

1.1 REFERENCE STANDARDS

A IEC 60929 - AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements; 2011, with Amendment (2015).

B UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

1.2 SUMMARY

A Refer to Drawings for specific room by room operational requirements.

B Where shown in the Drawings, Contractor shall furnish and install a complete low-voltage lighting control system consisting of, but not limited to, relays, contactors, controllers, enclosures, switch stations and miscellaneous components as required for a complete, operational lighting control system

C For new buildings, provide a wired solution. No wireless or battery-operated devices are allowed for any component of lighting control system.

D Lighting control devices shall be standalone, local controls. No networked systems shall be approved.

E Provide 6-year warranty on all components of lighting control system.

F Keyed override switches shall have full size key cylinders that can utilize district standard key way locks. Coordinate with Owner's Design Manager for key way type.

G Spaces with clerestory or full height windows shall design daylight harvesting sequences into overall lighting control system.

H Provide generator transfer device (GTD) on all fixture designated as emergency egress fixtures to allow local switch control.

I Light fixtures located above fire alarm annunciator panel and intrusion detection keypads shall be 100% on at all times.

J Common areas such as corridors, cafeteria, kitchen, gymnasiums and library shall be controlled via local on/off switch and connected to magnetically held contactors with interface to building automation system.
1. Local switch control in cafeteria and library shall be capable of dimming. Dimming shall also be provided in areas where projection systems are installed such as cafetoriums or large group instruction areas.
    a. For corridor lighting, provide local corridor lighting override keyed switch outside of electrical room where local lighting contactor is installed. This local switch will provide bypass around contactor in case contactor fails to operate.

K Provide local on/off lighting control switch in gymnasium. Locate switch in same lockable cabinet as bleacher and goal motor operators.

L Restroom lighting shall be controlled via local occupancy sensor with manual key switch override. Configure sensor for 100% output when active.

M For individual spaces such as office, storage rooms and workrooms, provide ceiling/wall mounted vacancy sensor with local dimming control switch at door.

N Occupancy sensors shall be dual technology and ceiling mounted with two independent relay outputs.

O Classroom lighting control shall be setup per the following requirements:
1. Control shall be setup to 50% occupancy mode when occupant enters the room.

2. Provide local 3 zone scene control switch adjacent to classroom door. Zones shall be configured for 100%, 50% and local A/V mode. Button shall also have “off” and up/down dimming control arrows.
3. At front presentation wall of classroom, provide on/off A/V switch with dimming to control lights nearest presentation wall.
4. Provide daylight harvesting as required by code.

P Exterior Lighting
1. Marquee sign is controlled separately. (See Division 32 for the marquee requirements)
2. Canopies are controlled separately from security lighting.
3. Security lighting (wall packs and soffit lighting) shall be controlled separately on each building elevation. (North side controlled separately from South side, etc...).
4. Parking lot lighting shall be circuited and controlled by zones (Staff parking, gym parking, auditorium parking, visitor parking, etc.)
5. Provide photo cell input to BAS.
6. All exterior lighting should be LED technology.

Q Interlocks
1. Interlock with fire alarm to enable all contactor-controlled fixtures to “on” status upon activation.
2. Interlock with security system to turn off all contactor-controlled fixtures upon arming of system.
3. Interlock with security system to turn on all contactor-controlled fixtures upon intruder activation.
4. Interlock with security system to enable partial lighting when system is first disarmed via contactor schedule.
5. Intent is to have three inputs from security system: armed, disarmed and activated

R Lighting Control System shall be configured to fail “on”.

1.3 QUALITY ASSURANCE:

A Factory Assembly: All relays, contactors, controllers, enclosures, switch stations and miscellaneous components shall be factory assembled and tested. All system components shall arrive at the job site completely pre-wired and ready for installation, requiring only the connection of lighting circuits and low-voltage control stations and/or network terminations. All connections shall be made to clearly and permanently labeled termination points. Systems that require field assembly shall not be acceptable.

B Manufacturer: A minimum of 20 years’ experience in the design and manufacture of lighting control equipment.

C Component Testing: All system components and assemblies shall be individually tested prior to assembly. Once assembled, all finished products shall be tested for proper operation of all control functions per specifications prior to shipment.

D NEC Compliance: All system components shall comply with all applicable sections of the National Electrical Code (NEC) as required.

E NEMA Compliance: All system components shall comply with all applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.

F UL Approval: All applicable equipment shall be UL listed under section 916 and shall bear labels indicating compliance.

G FCC Emissions: All applicable equipment shall comply with FCC emissions standards specified in Part 15 and Part 68 where applicable, for commercial applications and shall bear labels indicating compliance testing. Equipment that does not meet these standards shall not be acceptable

H System Support: Factory applications engineers shall be available for on-site training as well as telephone support.

1.4 OWNER INSTRUCTION:

A Manufacturer shall provide a factory-authorized application engineer to train owner personnel in the operation and programming of the lighting control system. Coordinate with Mechanical Division so that the BAS can be included in demonstrations. Provide a 2-hour period of on-site instruction and training to the Owner's designated personnel upon completion of the system installation and testing. The Operations and Maintenance Manual shall be complete and on-site at the time of Owner instruction.

B The Operations and Maintenance Manual shall be complete and on-site at the time of Owner instruction. Give three extra copies to Owner for use as training materials and for future reference by the Owner.

C Contractor shall submit written schedules with at least 21 days advance notice to relay system manufacturer and authorized local distributor for all on-site service, testing, commissioning and training times required from manufacturer and distributor. Relay system manufacturer and distributor staff shall be on-site and prepared for appropriate task in response to written schedule notification.

1.5 SUBMITTALS:

A Submit product data and shop drawings in accordance with Division 01 and Division 26 Section “Electrical Shop Drawings and Submittals” for products specified under PART 2 - PRODUCTS.

B Specification Compliance Certification: Submit a Specification Compliance Certification in accordance with Division 26 Section “Electrical Shop Drawings and Submittals.”

C Product Data:
1. Provide a written item-by-item specification review.
2. Submit a block diagram and complete point-to-point wiring diagram of the Lighting Control System. List manufacturer part numbers for all devices, wire sizes, and dimensions for major components.
3. Provide complete manufacturer's system documentation.
4. Provide a copy of the System Warranty.
5. Provide functional description and block diagrams of how lighting control system and Building Automation System will be linked together.
6. Include data for each device which:
   a. Indicates where sensor is proposed to be installed.
   b. Prove that the sensor is suitable for the propose application.
7. Submittal shall identify all connections between lighting control system and the Building Automation System.

D Shop Drawings:
1. Submit a one-line diagram of the system showing all panels, number and types of switches and sensors, dataline, programmable system switches, central controller. Include schematic of the interface to the Building Automation System (BAS).
2. Submit typical wiring diagrams for all components including, but not limited to, relay panels, relays, low voltage switches, programmable panel master switches, data communications devices and wire.
3. Provide relay panel schedules to identify all circuits controlled plus circuit load description.
4. Submit a dimension drawing of the typical local override manual switch.
5. Submit dimension drawing for each relay cabinet, switch plate and other major components. Show all relays labeled with actual branch circuits controlled and program group assignments.

E Closeout Submittal: Provide manuals and Record Drawings.

1.6 EXTRA MATERIALS:

A General: Provide extra materials for Owner's use. All parts shall be identical to the corresponding components of the installed systems.

B Spare Parts:

1. Provide 5 spares of each product listed below to be used for maintenance. Electrical contractor shall deliver items to FBISD maintenance within 30 days of substantial completion.
   a. Room Controllers
   b. Occupancy Sensors
   c. Emergency Bypass Controllers
   d. Low voltage Switches
   e. Daylighting Harvest Photocells

C Software Updates and Upgrades:
1. All software updates and upgrades released by the lighting control system manufacturer during the duration of the extended warranty period shall be furnished and properly installed into the lighting control relay system.

1.7 WARRANTY:

A Provide a full six-year warranty on the lighting control system.

B The warranty shall cover 100% of the parts and manufacturers labor costs to repair or replace components.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A Approved Manufacturers:
1. ILC (Basis of Design)
2. Acuity
3. Lutron
4. All other manufacturers require written express approval by Fort Bend ISD to be submitted ten days prior to bid due date. Include complete lighting control system documentation with approval request submittal.

B The basis of the specified system is ILC. The Contractor is responsible for providing a system to meet this specification. All deviations from this specification shall be identified in the submittal. Deviations are not authorized unless so noted by Engineer's comments on submittal.

2.2 LOW VOLTAGE OCCUPANCY SENSORS / SWITCHES

A Wall Mounted Line Voltage Dimmable Sensor: Type ILC-SWX-123-D:
1. Sensor shall be passive dual technology with 0-10v dimming. Program to operate as vacancy sensor, manual on to last level, with the option for the occupant to raise or lower the light level. Sensor shall detect small motion at up to 20'
2. Sensor shall be line voltage, 120/277vac, 50/60hz
3. Max load rating shall be 800W@120VAC, 1200W@277VAC
4. Load Types: LED, CFL, Incandescent
5. Dimming: 0-10VDC ballasts or drivers compliant with IEC 60929 Annex E.2.
6. Dimming Load: 50mA sink
7. Operating Temperature: 32deg F to 122deg F
8. Relative humidity: 0-95% non-condensing, indoor use only.

B Ceiling Mounted Low Voltage Sensor: Type ILC-SWX-2221-AR
1. Sensor shall be passive dual technology with 0-10v dimming.
2. Program to operate as either vacancy, automatic on to 50%, or occupancy, based on room type as detailed in the drawings and specifications.
3. Sensor shall detect small motion at up to 900 sqft, and large motion up to 2000sqft.
4. Sensor shall be low voltage: 12-24VAC/VDC
5. Current Draw: 10mA

6. Recommended power pack: ILC-SWX-900 series
7. Isolated relay: 1A @ 30 VDC/VAC
8. Operating Temperature: -10deg F to -122deg F
9. Relative humidity: 0-95% non-condensing, indoor use only.

C Low voltage dimming wall switch:
1. Low voltage momentary pushbutton switches with 3 buttons for dimming
2. Switch by default will turn on to last user level. An also be programmed to come on to a preset level (100%, 50%, or custom)
3. Program to operate as either vacancy, automatic on to 50%, or occupancy, based on room type as detailed in the drawings and specifications
4. Decorator style to fit common wall plates
5. LED locator light
6. Five segment LED indication of Dimmed Level
7. Sensor shall be low voltage: 5-24/VDC
8. Current Draw: 2mA
9. Dimming: 0-10VDC ballasts or drivers compliant with IEC 60929 Annex E.2.
10. Dimming Load: 50mA sink
11. Momentary pulse length: 250msec
12. Recommended power pack: ILC-SWX-900 series
13. Operating Temperature: -10deg F to -122deg F
14. Relative humidity: 0-95% non-condensing, indoor use only.
15. Dimmer curve: linear (default), square law, logarithmic
16. Fade on/off times: adjustable for ramp up/ramp down
17. High end and low end trim are adjustable

2.3 ROOM CONTROLLER

A LL-EVO Distributed Lighting Controller: Each controller shall be designed to be remotely installed and provide control of 1-4 remote load control relays.

B Enclosure: Each controller shall be provided with a NEMA 1 galvanized steel enclosure with a removable screw cover. It shall also be provided with a 1/2" nipple for mounting directly onto a junction box and pre-drilled mounting holes.

C Plenum Rated: Each controller shall be suitable for plenum mounting. Controllers without this rating shall be unacceptable.

D Controller Power Supply: Each lighting controller shall be provided with a dual-rated, UL listed Class 2 transformer capable of either 120/277 VAC or 120/347 VAC primary (50 to 60 Hz). It shall contain an internal self-resetting fuse.

E High Voltage Connections: Each controller shall be provided with 6” color coded wire leads for terminating the high voltage connections. All connections shall be made to clearly and permanently labeled termination points.

F Low Voltage Connections: Controllers shall also be provided with RJ45 connectors for the data line connections and remote relays. It shall also be provided push-to-connect connectors for occupancy sensors, dimming, and photocells. All connections shall be made to clearly and permanently labeled termination points.

G Occupancy Sensor Inputs: It shall have 4 independent inputs, and each input shall be able to interface multiple occupancy sensors or hardwired switches. Each input shall control any or all the relays in the lighting controllers or the dimmer outputs. Each controller shall provide 24VDC total power for the occupancy sensors with the following current capabilities:
1. 200mA w/4 LightSync devices connected to controller
2. 160mA w/5 LightSync devices connected to controller
3. 120mA w/6 LightSync devices connected to controller

4. 90mA w/7 LightSync devices connected to controller
5. 60mA w/8 LightSync devices connected to controller

H Photocell Inputs: It shall provide an integrated interface for up to 2 ILC photocell heads. The photo controller shall be provided with 256 light to dark levels (0-1800fc). It shall allow selection of 8 individual set points for OFF and ON and includes a selectable range of dead-band. It shall be programmable for 2 or 30 seconds delay. Each set point shall control any or all of the relays in the lighting controllers or the dimmer outputs.

I Local Data Line Port: It shall provide an RJ45 data line port for up to 61 LightSync data line devices. It shall provide power for LightSync devices as described in item “f”, or additional power added with an optional Power Supply Repeater.

J Dimming: Room controllers shall be provided with 4 independent 0-10V dimming control outputs that shall sink a maximum of 100mA per output. Each output shall be galvanically isolated up to 1500V to protect the electronics. Each output will revert to 100% upon a power loss.

K Real-Time Clock: Each controller shall be provided with a Real-Time Clock used to perform all time-controlled functions. It shall use a high voltage line-sync circuit for timing and a crystal for backup. Clock accuracy shall be held +/- 2 minutes per year and displayed to the second with the line-sync setting. Real-Time Clock functions shall include time of day, day of week, date and automatic daylight-saving time and leap year adjustments. Time clock shall be protected against loss of time during a power outage for a period of up to 45 days without power of any type. Daylight Saving Time shall be adjustable with an enable/disable feature. Systems relying on a single clock device shall not be acceptable.

L Pre-Configured Programs: Each controller shall have up to 16 pre-configured lighting application programs. Each lighting application program shall be selectable with a switch on the controller.

M Remote Relays: Each distributed lighting controller shall be provided with 1-4 single pole R20 or R20D relays

1. Remote Relay Enclosure: Each remote relay enclosure shall be made of ABS/PC plastic that is UL recognized.
2. Mounting: Each relay shall have a ½” electrical nipple for attaching to an electrical box. It shall also be provided with a ½” conduit nut for fastening.
3. Line Voltage Connections: Each relay shall be provided with 600V 6” wire leads for connection to line and load. Leads shall exit through the nipple of the relay.
4. Low Voltage Connections: It shall be provided with an RJ45 connector for interfacing and controlling the relay.
5. Latching Relay: The relay shall be a latching relay and shall not change state upon a power loss.
6. Ratings: The remote relays shall be rated for a minimum of 16 amps, and up to 347VAC. It shall be rated for resistive, general, ballast, and electronic ballast loads. It shall be able to control 1/2HP motor loads up to 120VAC.
7. 0-10V Dimming: An optional 0-10V dimming relay shall be provided, designated as R20D. Wire leads shall be provided and shall exit through the nipple of the relay. Leads shall be a minimum of 6” in length. It shall be acceptable to wire the 0-10V connection with the Class1 wiring. Each relay shall be able to sink the 0-10V dimming up to 100mA.
8. Certifications: Each relay shall be UL/CUL listed to UL 916 specifications. They shall be FCC Part 15. 109, Class B approved for radiated and conducted emissions.
9. Plenum Rating: The relay shall be plenum rated and clearly marked.
10. Made in the USA: Each relay shall be Made in the USA. Relays manufactured other than the USA shall be unacceptable.

N Room Controller Programming

1. Stand-alone: Room Controllers shall be programmable as a standalone lighting controller. Room Controllers shall be capable of being programmed, monitored, or backed-up using the Windows-based graphical software

2. Networked: Room Controllers and Programmable Control Panels shall be capable of being programmed, monitored, backed-up, or controlled through any of the below methods. All programming changes shall take effect immediately as they are programmed and shall not suspend or disable switches or other system functions. The same functions shall be available for any of the connection types.
3. Local Keypad and Display: The system user shall be able to program, monitor and control any of the controller features and functions through the use of simple menu-driven self-prompting user interface consisting of a 4-line 20-character backlit LCD display and 8 selection keys that change function based on the current operating mode
4. USB Serial Direct Connect: The system user shall be able to program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a USB port from a PC

PART 3 – EXECUTION

3.1 INSTALLATION:

A Contractor shall provide to the manufacturer all quantities for system including but not limited to relays, room controllers, relay panels, plug load controllers, switches, sensors and wire lengths and configurations for both network and device cable at least 1 week before bid.

B Electrical contractor must provide a detailed as-built plan in CAD showing devices, cable routing, and serial numbers at least 3 weeks prior to factory commissioning. Contractor shall note any deviations from the submittal drawings. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated.

C Electrical contractor shall be responsible for scheduling the following onsite coordination meetings through the duration of the project. Attendance shall be required for the GC, EC, representative from MEP firm, BAS Integrator and lighting control rep.
1. Pre-Installation- After submittals have been approved and material has arrived onsite and before installation of any devices begins. Review lighting control layout plans, required as-built information and terminations
2. Pre-Factory startup- Electrical contractor must have all lighting control devices installed, wired and tested at least 90 days prior to substantial completion deadline. At this coordination meeting the electrical contractor shall walk the site with attendees and go room by room to ensure they are ready for factory technician to start the system programming. Electrical contractor shall have his as built documentation of the system completed for this meeting.
3. Move in: 30 days prior to owner move in all parties shall meet onsite to review completed system. At this time all installation and factory programming shall be completed.

3.2 FACTORY COMMISSIONING:

A Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

B The factory commissioning shall include the following services. Programming of all button stations, configuration of all occupancy sensors and photocells. Verification of a complete and working system. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:
1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
3. Load Parameters (e.g. blink warning, etc.)

C The electrical contractor shall request factory commissioning by submitting a startup request form at least (4) weeks before startup is required.

D Electrical contractor must schedule lighting control factory start-up to begin at least 60 days prior to substantial completion deadline.

E Lighting control technician shall issue daily reports notifying of the project status, open issues, challenges, etc at the end of each day he/ she is onsite commissioning the system. Reports shall be sent directly to EC, GC and Engineer.

F At the completion of the first visit of the lighting control technician, all parties shall meet onsite to walk the project and evaluate any open issues. At this meeting the schedule for owner training shall be determined.

G The electrical contractor shall provide at least (1) journeyman electrician, familiar with the installation of the system, dedicated to assisting the factory start-up technician for the entire duration of the commissioning process.

H Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

I Re-commissioning – After 90 days from occupancy the factory authorized representative and electrical contractor shall re-calibrate all sensor time delays and sensitivities to meet the Owner’s Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity

J Owner operation memo- Lighting control manufacturer shall prepare an operational memo for owner to distribute informing building occupants of the operation of their lighting control system. Memo shall explain the following but not limited to: auto on/ vs manual on, occupancy sensors, daylight harvesting, plug load control, after hours time delays.

K BAS: Coordinate with Building Automation System. BAS shall be available for commissioning of lighting control relay system. Demonstrate all BAS-relay links for time schedule control and manual bypass switching control.

L Record Drawings. Contractor shall provide Record Drawings of each load with actual installed connected lighting load information per relay. Lighting load information shall include each Room Name and Number for every room and space controlled by each relay.

3.3 TESTING:

A A test run shall be performed by the authorized factory representative in the presence of the Owner, Architect, and Engineer.

B BAS: Building Automation System shall be available during testing of contactors. Demonstrate BAS link and BAS-programmed time control of contactors.

C Provide 100% test of every sensor, room controller, and contactor switch in the system. Each area shall be demonstrated to respond to all manual and programmed sequences, including local manual switches, keyed switches and time control programs.

D Submit a written test report.

3.4 FUNCTIONAL TESTING OF LIGHTING CONTROLS:

A General: Lighting control devices and control systems shall be tested to ensure that control hardware and software are calibrated, adjusted, programmed, and in proper working condition in accordance with the energy code, construction documents and manufacturer’s installation instructions. When occupant sensors, time switches, programmable schedule controls, or photosensors are installed, at a minimum, the following procedures shall be performed:

1. Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance, lights turn off only after space is vacated and do not turn on unless space is occupied.
2. Confirm that the time switches and programmable schedule controls are programmed to run the lights off.

3. Confirm that photosensor controls reduce electric light levels based on the amount of usable daylight in the space as specified.

B IECC:

1. Occupancy Sensor Light Controls
   a. Where occupant sensor controls are provided, the following procedures shall be performed.
   b. Certify that the occupant sensor has been located and aimed in accordance with manufacturer recommendations.
   c. For projects with seven or fewer occupant sensors, each sensor shall be tested.
   d. For projects with more than seven occupant sensors, testing shall be done for each unique combination of sensor type and space geometry. Where multiples of each unique combination of sensor type and space geometry are provided, not less than 10 percent, but in no case less than one, of each combination shall be tested unless the code official or design professional requires a higher percentage to be tested. Where 30 percent or more of the tested controls fail, all remaining identical combinations shall be tested.
2. For occupant sensor controls to be tested, verify the following:
   a. Where occupant sensor controls include status indicators, verify correct operation.
   b. The controlled lights turn off or down to the permitted level within the required time.
   c. For auto-on occupant sensor controls, the lights turn on to the permitted level when an occupant enters the space.
   d. For manual-on occupant sensor controls, the lights turn on only when manually activated.
   e. The lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.
3. Time-switch controls: Where time-switch controls are provided, the following procedures shall be performed:
   a. Confirm that the time-switch control is programmed with accurate weekday, weekend and holiday schedules.
   b. Provide documentation to the owner of time-switch controls programming including weekday, weekend, holiday schedules, and set-up and preference program settings.
   c. Verify the correct time and date in the time switch.
   d. Verify that any battery back-up is installed and energized.
   e. Verify that the override time limit is set to not more than 2 hours.
   f. Simulate occupied condition. Verify and document the following:
   g. All lights can be turned on and off by their respective area control switch.
   h. The switch only operates lighting in the enclosed space in which the switch is located.
   i. Simulate unoccupied condition. Verify and document the following:
   j. Nonexempt lighting turns off.
   k. Manual override switch allows only the lights in the enclosed space where the override switch is located to turn on or remain on until the next scheduled shutoff occurs.
   l. Additional testing as specified by the registered design professional.
4. Daylight responsive controls:
   a. Control devices have been properly located, field calibrated, and set for accurate setpoints and threshold light levels.
   b. Daylight controlled lighting loads adjust to light level set points in response to available daylight.
   c. The locations of calibration adjustment equipment are readily accessible only to authorized personnel.

C Testing Service: Provide an independent testing service to conduct and certify the functional testing. The party responsible for the functional testing shall not be directly involved in either the design or construction of the project. The same party shall provide documentation certifying that the installed lighting controls meet or exceed all documented performance criteria. Certification shall be specific enough to verify conformance. All test results and certifications shall be submitted in electronic document format.

3.5 SOFTWARE PROGRAMMING:

A Provide all work required for complete software set-up. This shall include, but shall not be limited to:
1. all relay and group definitions
2. all coordination with the supplier of the Building Automation System (BAS).
3. Wiring documentation.
4. Switch operation.
5. Operating schedules

B Submit proposed ON/OFF schedules for each building area to Owner for review and approval. Modify relay assignments and scheduling as required by review to prepare system for turn-key handoff to Owner.

3.6 DEVICE MOUNTING:

A Any occupancy sensors, wall switches and other devices installed shall be mounted to suitable outlet box. Provide a 1/2" EMT raceway stub to nearest accessible ceiling cavity or all the way to relay panel if none. Terminate vertical raceway stubs in walls with an elbow fitting to facilitate pulling in cable without damage.

END OF SECTION

SECTION 26 22 00 - LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A General purpose transformers.

B K-factor transformers rated for nonlinear loads.

1.2 RELATED REQUIREMENTS

A Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C Section 26 05 29 - Hangers and Supports for Electrical Systems.

D Section 26 05 33.13 - Conduit for Electrical Systems: Flexible conduit connections.

E Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.

C IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.

D NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.

F NEMA ST 20 - Dry Type Transformers for General Applications; 2021.

G NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

H NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

I NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.

K UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Provide a Specification Compliance Certification in accordance with Section 260120.

C Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.
1. K-factor Rated Transformers: Include K-factor ratings.

D Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.

E Source Quality Control Test Reports: Include reports for tests designated in NEMA ST 20 as design and routine tests.

F Field Quality Control Test Reports.

1.6 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.
1. Greater than 10 kVA: 104 degrees F maximum.
2. Less than 10 kVA: 77 degrees F maximum.

1.9 WARRANTY

A See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB: www.electrification.us.abb.com/#sle.
2. Acme Electric; Hubbell.
3. Eaton Corporation: www.eaton.com/#sle.
4. Schneider Electric: www.se.com/#sle.
5. Siemens Industry, Inc: www.new.siemens.com/#sle.

B Source Limitations: Provide transformers produced by single manufacturer and obtained from single supplier.

2.2 TRANSFORMERS - GENERAL REQUIREMENTS

A Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
1. Altitude: Less than 3,300 feet.
2. Ambient Temperature:
   a. Greater than 10 kVA: Not exceeding 104 degrees F.
   b. Less than 10 kVA: Not exceeding 77 degrees F.

C Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

E Basic Impulse Level: 10 kV.

F Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

G Isolate core and coil from enclosure using vibration-absorbing mounts.

H Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.3 GENERAL PURPOSE TRANSFORMERS

A Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B Insulation System and Allowable Average Winding Temperature Rise:
1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
2. 15 kVA and Larger: Class 220 degrees C insulation system with 115 degrees C average winding temperature rise.

C Coil Conductors: Continuous copper windings with terminations brazed or welded.

D Winding Taps:
1. Less than 3 kVA: None.
2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.

E Energy Efficiency: Comply with 10 CFR 431, Subpart K.

F Sound Levels: Standard sound levels complying with NEMA ST 20

G Mounting Provisions:
1. Less than 15 kVA: Suitable for wall mounting.
2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
3. Larger than 75 kVA: Suitable for floor mounting.

H Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor clean, dry locations: Type 2.
b. Outdoor locations: Type 3R.

2. Construction: Steel.
a. Less than 15 kVA: Totally enclosed, non-ventilated.
b. 15 kVA and Larger: Ventilated.

3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
4. Provide lifting eyes or brackets.

I Accessories:
1. Mounting Brackets: Provide manufacturer's standard brackets.
2. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

2.4 K-FACTOR TRANSFORMERS RATED FOR NONLINEAR LOADS

A Description: Self-cooled, two winding transformers listed and labeled as complying with UL 1561, and designed to supply nonlinear loads to the degree designated by the UL defined K-factor; ratings as indicated on the drawings.

B K-factor Rating: K-13, or higher. Refer to rating as indicated.

C Insulation System and Allowable Average Winding Temperature Rise: Class 220 degrees C insulation system with 115 degrees C average winding temperature rise.

D Coil Conductors: Continuous copper windings with terminations brazed or welded. Individually insulate secondary conductors and arrange to minimize hysteresis and eddy current losses at harmonic frequencies. Size secondary neutral conductor at twice the secondary phase conductor ampacity.

E Winding Taps: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.

F Neutral Bus: Sized to accommodate twice the rated secondary current.

G Energy Efficiency: Comply with 10 CFR 431, Subpart K.

H Sound Levels: Standard sound levels complying with NEMA ST 20

I Mounting Provisions:
1. Up to 75 kVA: Suitable for wall, floor, or trapeze mounting.
2. Larger than 75 kVA: Suitable for floor mounting.

J Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
a. Indoor clean, dry locations: Type 2.
b. Outdoor locations: Type 3R.
2. Construction: Steel, ventilated.
3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
4. Provide lifting eyes or brackets.

K Accessories:
1. Mounting Brackets: Provide manufacturer's standard brackets.
2. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

2.5 SOURCE QUALITY CONTROL

A Factory test transformers according to NEMA ST 20.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.

C Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.

D Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Perform work in accordance with NECA 1 (general workmanship).

B Install products in accordance with manufacturer's instructions.

C Install transformers in accordance with NECA 409 and IEEE C57.94.

D Use flexible conduit, under the provisions of Section 26 05 33.13, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

E Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

F Install transformers plumb and level.

G Transformer Support:
1. Provide required support and attachment in accordance with Section 26 05 29, where not furnished by transformer manufacturer.
2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 4 inch nominal high concrete pad constructed in accordance with Section 03 30 00.
4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

H Provide grounding and bonding in accordance with Section 26 05 26.

I Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

J Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

K Identify transformers in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Inspect and test in accordance with NETA ATS, except Section 4.

C Perform inspections and tests listed in NETA ATS Sections 7.2.1.1 and 7.2.1.2. Tests and inspections listed as optional are not required.

D Perform infrared scan tests and inspections and prepare report:
1. Initial Infrared Scanning: After Substantial Completion, but no more than 60 days after Final Acceptance, perform an infrared scan of each transformer under load. Remove front panels so joints and connections are accessible to portable scanner.

2. Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

3.4 ADJUSTING

A Measure primary and secondary voltages and make appropriate tap adjustments.

B Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

C Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

3.5 CLEANING

A Clean dirt and debris from transformer components according to manufacturer's instructions.

B Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 24 13 - SWITCHBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.

B Overcurrent protective devices for switchboards.

1.2 RELATED REQUIREMENTS

A Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C Section 26 05 29 - Hangers and Supports for Electrical Systems.

D Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

F Section 26 21 00 - Low-Voltage Electrical Service Entrance.
1. Includes Utility Company contact information.

G Section 26 43 00 - Surge Protective Devices.

1.3 REFERENCE STANDARDS

A FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

C NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.

E NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

F NEMA PB 2 - Deadfront Distribution Switchboards; 2011.

G NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; 2013.

H NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

I NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

K UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

L UL 891 - Switchboards; Current Edition, Including All Revisions.

M UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B Service Entrance Switchboards:
1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
2. See Section 26 21 00 for Utility Company contact information and additional requirements.

1.5 PERFORMANCE REQUIREMENTS

A Overcurrent Protective Device Coordination for Emergency Systems and Legally Required Standby Systems: All overcurrent protective devices proposed for inclusion in the Work on the Emergency Systems branch (NEC Article 700) and the Legally Required Standby System branch (NEC Article 701) shall be selected to be selectively coordinated with the overcurrent protective devices installed on their supply side such that an overcurrent event (overload, short-circuit, or ground-fault) occurring at the lowest level in the system (branch circuit) cannot cause the feeder protective device supplying the branch circuit panelboard to open. This coordination shall be carried through each level of distribution for both normal and emergency power. See Section 260573 for additional requirements.

B Overcurrent Protective Device Coordination: All overcurrent protective devices proposed for inclusion in the Work shall be selected to be coordinated with the overcurrent protective devices installed on their supply side such that an overcurrent event (overload, short-circuit, or ground-fault) occurring at the lowest level in the system (branch circuit) cannot cause the feeder protective device supplying the branch circuit panelboard to open. This coordination shall be carried through each level of distribution for both normal and emergency power to 0.10 seconds. See Section 260573 for additional requirements.

1.6 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Provide a Specification Compliance Certification in accordance with Section 260120.

C Simultaneous Action Submittals: Switchboard product data submittal shall be made in conjunction with submittal required under Section 260573. The release of electrical equipment submittals is dependent on the receipt of a complete and accurate overcurrent protective device coordination study.

D Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.

E Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.

F Field Quality Control Test Reports.

G Project Record Documents: Record actual installed locations of switchboards and final equipment settings.

H Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.7 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

A Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.

B Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.

C Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.9 FIELD CONDITIONS

A Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Switchboards: Subject to compliance with requirements, provide products by one of the following:
1. ABB: www.electrification.us.abb.com/#sle.
2. Eaton Corporation: www.eaton.com/#sle.
3. Schneider Electric: www.se.com/#sle.
4. Siemens Industry, Inc: www.new.siemens.com/#sle.

B Source Limitations: Provide switchboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.2 SWITCHBOARDS

A Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B Provide products listed, classified, and labeled as suitable for the purpose intended.

C Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.

D Front-Connected Switchboards:
1. Main and Tie Device(s): Individually-mounted.
2. Feeder Devices: Panel/group-mounted.
3. Arrangement: Front accessible only (not rear accessible), rear aligned.
4. Gutter Access: Bolted covers.

E Service Entrance Switchboards:
1. Listed and labeled as suitable for use as service equipment according to UL 869A.
2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.
3. Comply with Utility Company requirements for electrical service.

F Service Conditions:
1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
   a. Altitude: Less than 6,600 feet.
   b. Ambient Temperature:
      1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F and 104 degrees F.

G Short Circuit Current Rating:
1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
2. Minimum Rating: 100,000 rms symmetrical amperes.

H Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

I Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.

J Bussing: Sized in accordance with UL 891 temperature rise requirements.
1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
2. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
3. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
4. Phase and Neutral Bus Material: Copper.
5. Ground Bus Material: Copper.

K Conductor Terminations: Suitable for use with the conductors to be installed.
1. Line Conductor Terminations:
   a. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
   b. Main and Neutral Lug Type: Mechanical.
2. Load Conductor Terminations:
   a. Lug Material: Copper, suitable for terminating copper conductors only.
   b. Lug Type:
      1) Provide mechanical lugs unless otherwise indicated.

L Enclosures:
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).
2. Finish: Manufacturer's standard unless otherwise indicated.

M Future Provisions:
1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
2. Equip distribution sections with full height vertical bussing to accommodate maximum utilization of space for devices.
3. Arrange and equip through bus and ground bus to accommodate future installation of additional switchboard sections.

N Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list switchboards as a complete assembly including surge protective device.

O Phase Loss Protection: Provide a phase failue relay on main circuit breaker(s) complete with capacitor trip device and shunt trip. Relay shall be able to be bypassed at any time. All devices shall be factory installed.
1. Basis of Design:
   a. Taylor Electronics, Inc. Phase-Guard PND Model
2. Provide the following options and accessories on the phase failure relay:
   a. Adjustable phase unbalance from 5 to 15 percent.
   b. Adjustable time delay from 0.5 to 20 seconds.
   c. Remote display module mounted to the front of the main section of teh switchboard with USB connection for computer.
   d. Relay shall not trip on total power loss.

P Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
1. Where overcurrent protective devices equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

Q Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.

R Owner Metering:
1. Provide microprocessor-based digital electrical metering system including all instrument transformers, wiring, and connections necessary for measurements specified.
2. Basis of Design: Electro Industries/GaugeTech Shark 100.
3. Measured Parameters:
   a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
   b. Current (Amps): For each phase.
   c. Frequency (Hz).
   d. Real power (kW): For each phase, 3-phase total.
   e. Reactive power (kVAR): For each phase, 3-phase total.
   f. Apparent power (kVA): For each phase, 3-phase total.
   g. Power factor.
   h. Real energy (kWh). Accumulated values unaffected by power outages up to 72 hours.
   i. Current demand. Demand interval programmable from five to 60 minutes.
   j. Power demand: Real, reactive, and apparent.
4. Meter Accuracy: Plus/minus 1.0 percent.
5. Features:
   a. Communications Capability: Compatible with system indicated Utilize 10/100BaseT Ethernet with Modbus TCP protocol capabilities to interface with building automation controls system. Provide all accessories necessary for proper interface.
   b. Adjustable demand interval.

S Instrument Transformers:
1. Comply with IEEE C57.13.
2. Select suitable ratio, burden, and accuracy as required for connected devices.
3. Current Transformers: Connect secondaries to shorting terminal blocks.
4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.3 OVERCURRENT PROTECTIVE DEVICES

A Circuit Breakers:
1. Interrupting Capacity:
   a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

2. Molded Case Circuit Breakers:
   a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
      1) Provide electronic trip circuit breakers for feeders serving Emergency Systems or Legally Required Standby Systems.
   b. Minimum Interrupting Capacity:
      1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      2) 14,000 rms symmetrical amperes at 480 VAC.
   c. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
      1) Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
      2) Provide interchangeable trip units where indicated.
   d. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
      1) Provide the following field-adjustable trip response settings:
         (a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
         (b) Long time delay.
         (c) Short time pickup and delay.
         (d) Instantaneous pickup.
         (e) Ground fault pickup and delay where ground fault protection is indicated.
      2) Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.
   e. Provide the following features and accessories where indicated or where required to complete installation:
      1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
      2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.
      3) Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.

3. Insulated Case Circuit Breakers:
   a. Description: Quick-make, quick-break, trip-free circuit breakers with two-step stored energy closing mechanism; standard 80 percent rated unless otherwise indicated; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.
      1) Provide insulated case circuit breakers for Main and Tie breakers.
   b. Operation:
      1) Provide manually operated circuit breakers.
      2) Pad-Lock Provision: For preventing circuit breaker closing operation.
   c. Construction:
      1) Provide fixed-mount circuit breakers.
   d. Minimum Interrupting Capacity:
      1) 65,000 rms symmetrical amperes at 480 VAC.
   e. Trip Units: Solid state, microprocessor-based, true rms sensing.
      1) Provide the following field-adjustable trip response settings:
         (a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
         (b) Short time pickup and delay.

(c) Instantaneous pickup.
(d) Ground fault pickup and delay where ground fault protection is indicated.

2) Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.

f. Provide the following features and accessories where indicated or where required to complete installation:
1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
2) Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.

2.4 SOURCE QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:
1. Dielectric tests.
2. Mechanical operation tests.
3. Grounding of instrument transformer cases test.
4. Electrical operation and control wiring tests, including polarity and sequence tests.
5. Ground-fault sensing equipment test.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.

C Verify that mounting surfaces are ready to receive switchboards.

D Verify that conditions are satisfactory for installation prior to starting work.

E Verify underground conduit rough-in complies with the following:
1. Wiring entries comply with layout requirements.
2. Entires are within conduit-entry tolerances specified by manufacturer and no feeders will have to corss section barriers to reach load lugs.

3.2 INSTALLATION

A Install products in accordance with manufacturer's instructions.

B Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.

C Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.

D Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.

E Provide required support and attachment in accordance with Section 26 05 29.

F Install switchboards plumb and level.

G Unless otherwise indicated, mount switchboards on properly sized 4 inch nominal high concrete pad constructed in accordance with Section 03 30 00.

H Provide grounding and bonding in accordance with Section 26 05 26.

I Install all field-installed devices, components, and accessories.

J Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.

L Set field-adjustable ground fault protection pickup and time delay settings as directed.

M Provide filler plates to cover unused spaces in switchboards.

N Identify switchboards in accordance with Section 26 05 53.
1. Label each overcurrent protective device and each meter and control device mounted in compartment doors with an identification label.

O Remove temporary lifting eyes, channels, brackets, and blocking of moving parts from switchboard units and components once unit is secured in place.

P Operating Instructions: Provide identification label in accordance with Section 26 05 53 with basic operating instructions for switchboard including control and key interlocking sequences and emergency procedures. Mount on front of switchboard at main breaker section.

3.3 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Provide services of a manufacturer's authorized representative to perform inspection and testing. Include manufacturer's reports with submittals.

C Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.

E Inspect and test in accordance with NETA ATS, except Section 4.

F Perform inspections and tests listed in NETA ATS, Section 7.1.

G Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 100 amperes. Tests listed as optional are not required.

H Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

I Meters: Perform inspections and tests listed in NETA ATS, Section 7.11.2.

J Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.

K Test shunt trips to verify proper operation.

L Correct deficiencies and replace damaged or defective switchboards or associated components.

M Submit detailed reports indicating inspection and testing results and corrective actions taken.

N Perform infrared scan tests and inspections and prepare report:

1. Initial Infrared Scanning: After Substantial Completion, but no more than 60 days after Final Acceptance, perform an infrared scan of each switchboard under load. Remove front panels so joints and connections are accessible to portable scanner.
2. Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

3.4 ADJUSTING

A Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B Adjust alignment of switchboard covers and doors.

C Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

3.5 CLEANING

A Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.

B Repair scratched or marred surfaces to match original factory finish.

3.6 CLOSEOUT ACTIVITIES

A See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B See Section 01 79 00 - Demonstration and Training, for additional requirements.

C Training: Train Owner's personnel on operation, adjustment, and maintenance of switchboard and associated devices.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Manufacturer's authorized representative.
4. Location: At project site.

3.7 PROTECTION

A Protect installed switchboards from subsequent construction operations.

END OF SECTION

SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Power distribution panelboards.

B Lighting and appliance panelboards.

C Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C Section 26 05 29 - Hangers and Supports for Electrical Systems.

D Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.3 REFERENCE STANDARDS

A FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E NEMA PB 1 - Panelboards; 2011.

F NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.

G NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

H NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K UL 67 - Panelboards; Current Edition, Including All Revisions.

L UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 PERFORMANCE REQUIREMENTS

A Overcurrent Protective Device Coordination for Emergency Systems and Legally Required Standby Systems: All overcurrent protective devices proposed for inclusion in the Work on the Emergency Systems branch (NEC Article 700) and the Legally Required Standby System branch (NEC Article 701) shall be selected to be selectively coordinated with the overcurrent protective devices installed on their supply side such that an overcurrent event (overload, short-circuit, or ground-fault) occurring at the lowest level in the system (branch circuit) cannot cause the feeder protective device supplying the branch circuit panelboard to open. This coordination shall be carried through each level of distribution for both normal and emergency power. See Section 260573 for additional requirements.

B Overcurrent Protective Device Coordination: All overcurrent protective devices proposed for inclusion in the Work shall be selected to be coordinated with the overcurrent protective devices installed on their supply side such that an overcurrent event (overload, short-circuit, or ground-fault) occurring at the lowest level in the system (branch circuit) cannot cause the feeder protective device supplying the branch circuit panelboard to open. This coordination shall be carried through each level of distribution for both normal and emergency power to 0.10 seconds. See Section 260573 for additional requirements.

1.6 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Provide a Specification Compliance Certification in accordance with Section 260120.

C Simultaneous Action Submittals: Panelboard product data submittal shall be made in conjunction with submittal required under Section 260573. The release of electrical equipment submittals is dependent on the receipt of a complete and accurate overcurrent protective device coordination study.

D Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

E Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

F Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.

G Field Quality Control Test Reports.

H Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.7 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

A Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB: www.electrification.us.abb.com/#sle.
2. Eaton Corporation: www.eaton.com/#sle.
3. Schneider Electric: www.se.com/#sle.
4. Siemens Industry, Inc: www.new.siemens.com/#sle.

B Source Limitations: Provide panelboards and associated components produced by single manufacturer and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A Provide products listed, classified, and labeled as suitable for the purpose intended.

B Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet.
2. Ambient Temperature:
   a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C Short Circuit Current Rating:
1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
2. Listed series ratings are not acceptable.

D Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F Bussing: Sized in accordance with UL 67 temperature rise requirements.
1. Provide fully rated neutral bus where neutral is indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
2. Provide 200 percent rated neutral bus and lugs where panelboards are fed from K-rated transformers.
3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G Conductor Terminations: Suitable for use with the conductors to be installed.

H Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1.
   b. Outdoor Locations: Type 3R.
2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.
b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.

3. Fronts:
a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.
5. Panelboard Label: Manufacturer's name and trademark, voltage, phase, and amerage shall be located on the interior of the panelboard door.

I Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

K Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

L Load centers are not acceptable.

M Provide the following features and accessories where indicated or where required to complete installation:
1. Feed-through lugs.

2.3 POWER DISTRIBUTION PANELBOARDS

A Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B Conductor Terminations:
1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
2. Main and Neutral Lug Type: Mechanical.

C Bussing:
1. Phase and Neutral Bus Material: Copper.
2. Ground Bus Material: Copper.

D Circuit Breakers:
1. Provide bolt-on type.
2. Provide thermal magnetic circuit breakers unless otherwise indicated.
3. Provide electronic trip circuit breakers where indicated and for feeders serving Emergency Systems or Legally Required Standby Systems.

E Enclosures:
1. Provide surface-mounted enclosures unless otherwise indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
a. Doors shall be secured with vault-type latch with tumbler lock.
b. For doors taller than 48 inches, provide two latches, keyed alike.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.4 LIGHTING AND APPLIANCE PANELBOARDS

A Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B Conductor Terminations:

1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
2. Main and Neutral Lug Type: Mechanical.

C Bussing:
1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Copper.
3. Ground Bus Material: Copper.

D Circuit Breakers: Thermal magnetic bolt-on type.

E Enclosures:
1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.
4. Each panelboard enclosure shall be limited to 42 pole spaces unless otherwise indicated. If additional pole space is required, an additional enclosure shall be provided with feed through lugs.

2.5 OVERCURRENT PROTECTIVE DEVICES

A Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
   a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      2) 14,000 rms symmetrical amperes at 480 VAC.
   b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   c. Faceplate on breaker shall list current rating, UL and IEC certification standards, and AIC rating.
3. Conductor Terminations:
   a. Provide mechanical lugs unless otherwise indicated.
   b. Lug Material: Copper, suitable for terminating copper conductors only.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
   b. Provide interchangeable trip units where indicated.
5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
   a. Provide the following field-adjustable trip response settings:
      1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
      2) Long time delay.
      3) Short time pickup and delay.
      4) Instantaneous pickup.
      5) Ground fault pickup and delay where ground fault protection is indicated.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
7. Provide the following circuit breaker types where indicated:
   a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
   b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.

8. Do not use tandem circuit breakers.
9. Do not use handle ties in lieu of multi-pole circuit breakers.
10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
11. Provide the following features and accessories where indicated or where required to complete installation:
    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.6 SOURCE QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C Verify that mounting surfaces are ready to receive panelboards.

D Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Perform work in accordance with NECA 1 (general workmanship).

B Install products in accordance with manufacturer's instructions.

C Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E Provide required support and attachment in accordance with Section 26 05 29.

F Install panelboards plumb.

G Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

I Mount floor-mounted power distribution panelboards on properly sized 4 inch nominal high concrete pad constructed in accordance with Section 03 30 00.

J Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

K Provide grounding and bonding in accordance with Section 26 05 26.

L Install all field-installed branch devices, components, and accessories.

M Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

N Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

O Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.

P Set field-adjustable ground fault protection pickup and time delay settings as directed.

Q Provide filler plates to cover unused spaces in panelboards.

R Identify panelboards in accordance with Section 26 05 53.

1. Circuit Directory: Provide computer-generated, type-written circuit directory mounted inside panelboard door with transparent plastic cover. Circuit directory shall identify specific load type for each circuit with sufficient detail to distinguish it from all other circuits.
   a. Circuit load description shall include room number. Use Owner-approved final room numbers, not room numbers indicated on drawings.

3.3 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Inspect and test in accordance with NETA ATS, except Section 4.

C Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

D Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E Test GFCI circuit breakers to verify proper operation.

F Test shunt trips to verify proper operation.

G Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

H Correct deficiencies and replace damaged or defective panelboards or associated components.

I Perform infrared scan test and inspections and prepare report:

1. Initial Infrared Scanning: After Substantial Completion, but no more than 60 days after Final Acceptance, perform an infrared scan of each panelboard under load. Remove front covers so joints and connections are accessible to portable scanner.
2. Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

3.4 ADJUSTING

A Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B Adjust alignment of panelboard fronts.

C Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A Wall switches.

B Receptacles.

C Wall plates and covers.

D Floor box service fittings.

E Poke-through assemblies.

1.2 RELATED REQUIREMENTS

A Section 26 05 33.16 - Boxes for Electrical Systems.

B Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C Section 27 10 00 - Structured Cabling: Voice and data jacks.

1.3 REFERENCE STANDARDS

A FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).

B FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).

C NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.

6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B Sequencing:
1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C Field Quality Control Test Reports.

D Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E Operation and Maintenance Data:
1. GFCI Receptacles: Include information on status indicators.

1.6 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

B Products: Listed, classified, and labeled as suitable for the purpose intended.

1.7 DELIVERY, STORAGE, AND PROTECTION

A Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 WIRING DEVICE APPLICATIONS

A Provide wiring devices suitable for intended use and with ratings adequate for load served.

B For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D Provide tamper resistant receptacles for receptacles installed in dwelling units.

E Provide GFCI protection for receptacles installed within 6 feet of sinks.

F Provide GFCI protection for receptacles installed in kitchens.

G Provide GFCI protection for receptacles serving electric drinking fountains.

2.2 WIRING DEVICE FINISHES

A Provide wiring device finishes as described below unless otherwise indicated.

B Wiring Devices, Unless Otherwise Indicated: Gray with stainless steel wall plate.

C Wiring Devices Installed in Wet or Damp Locations: Gray with specified weatherproof cover.

D Wiring Devices Connected to Emergency Power: Red with stainless steel wall plate factory engraved "Emergency".

E Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.

F Flush Poke-Through Service Fittings: Gray wiring devices with aluminum cover and aluminum flange.

2.3 WALL SWITCHES

A Manufacturers:
1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.4 RECEPTACLES

A Manufacturers:
1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

C Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.
3. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
4. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
5. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

E USB Charging Devices:
1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

F Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.
1. Standard Locking Convenience Receptacles: Single, 20A, 125V, NEMA L5-20R.

2.5 WALL PLATES AND COVERS

A Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
2. Size: Standard.
3. Screws: Metal with slotted heads finished to match wall plate finish.

B Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

C Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

D Weatherproof Receptacle Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

E Weatherproof Receptacle Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.6 FLOOR BOX SERVICE FITTINGS

A Manufacturers:
1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
2. Wiremold, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

B Description: Service fittings compatible with floor boxes provided under Section 26 05 33.16 with components, adapters, and trims required for complete installation.

C Flush Floor Service Fittings:
1. Single Service Flush Convenience Receptacles:
   a. Cover: Rectangular.
   b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
2. Single Service Flush Communications Outlets:
   a. Cover: Rectangular.
   b. Configuration: _____.
   c. Voice and Data Jacks: As specified in Section 27 10 00.
3. Single Service Flush Furniture Feed:
   a. Cover: Rectangular.
   b. Configuration: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
4. Dual Service Flush Combination Outlets:
   a. Cover: Rectangular.
   b. Configuration:
      1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
      2) Communications: _____.
      3) Voice and Data Jacks: As specified in Section 27 10 00.
5. Dual Service Flush Furniture Feed:

a. Cover: Rectangular.
b. Configuration:
1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).

6. Accessories:
a. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

2.7 POKE-THROUGH ASSEMBLIES

A Manufacturers:
1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
2. Wiremold, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

B Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

C Flush Floor Service Fittings:
1. Single Service Flush Convenience Receptacles:
a. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
2. Single Service Flush Communications Outlets:
a. Configuration: _____.
b. Voice and Data Jacks: As specified in Section 27 10 00.
3. Single Service Flush Furniture Feed:
a. Configuration: One 2 inch by 1-1/4 inch combination threaded opening(s).
4. Dual Service Flush Combination Outlets:
a. Cover: Hinged door(s).
b. Configuration:
1) Power: One standard convenience duplex receptacle(s).
2) Communications: _____.
3) Voice and Data Jacks: As specified in Section 27 10 00.
5. Dual Service Flush Furniture Feed:
a. Configuration:
1) Power: One 3/4 inch threaded opening(s).
2) Communications: Two 1/2 inch threaded opening(s).
6. Accessories:
a. Closure Plugs: Size and fire rating as required to seal unused core hole and maintain fire rating of floor.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C Verify that wall openings are neatly cut and will be completely covered by wall plates.

D Verify that final surface finishes are complete, including painting.

E Verify that floor boxes are adjusted properly.

F Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G Verify that core drilled holes for poke-through assemblies are in proper locations.

H Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A Provide extension rings to bring outlet boxes flush with finished surface.

B Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
1. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
2. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
3. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
4. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C Install wiring devices in accordance with manufacturer's instructions.

D Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I Install wiring devices plumb and level with mounting yoke held rigidly in place.

J Install wall switches with OFF position down.

K Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

L Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

M Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

N Identify wiring devices in accordance with Section 26 05 53.

O Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

3.4 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Inspect each wiring device for damage and defects.

C Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D Test each receptacle to verify operation and proper polarity.

E Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

A Adjust devices and wall plates to be flush and level.

3.6 CLEANING

A Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 28 13 - FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A Fuses.

B Spare fuse cabinet.

1.2 RELATED REQUIREMENTS

A Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

B Section 26 05 73 - Power System Studies: Additional criteria for the selection of protective devices specified in this section.

1.3 REFERENCE STANDARDS

A NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.

E UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 PERFORMANCE REQUIREMENTS

A Overcurrent Protective Device Coordination for Emergency Systems and Legally Required Standby Systems: All overcurrent protective devices proposed for inclusion in the Work on the Emergency Systems branch (NEC Article 700) and the Legally Required Standby System branch (NEC Article 701) shall be selected to be selectively coordinated with the overcurrent protective devices installed on their supply side such that an overcurrent event (overload, short-circuit, or ground-fault) occurring at the lowest level in the system (branch circuit) cannot cause the feeder protective device supplying the branch circuit panelboard to open. This coordination shall be carried through each level of distribution for both normal and emergency power. See Section 260573 for additional requirements.

B Overcurrent Protective Device Coordination: All overcurrent protective devices proposed for inclusion in the Work shall be selected to be coordinated with the overcurrent protective devices installed on their supply side such that an overcurrent event (overload, short-circuit, or ground-fault) occurring at the lowest level in the system (branch circuit) cannot cause the feeder protective device supplying the branch circuit panelboard to open. This coordination shall be carried through each level of distribution for both normal and emergency power to 0.10 seconds. See Section 260573 for additional requirements.

1.6 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Provide a Specification Compliance Certification in accordance with Section 260120.

C Simultaneous Action Submittals: Fuse product data submittal shall be made in conjunction with submittal required under Section 260573. The release of electrical equipment submittals is dependent on the receipt of a complete and accurate overcurrent protective device coordination study.

D Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
1. Spare Fuse Cabinet: Include dimensions.

E Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Fuses: One set(s) of three for each type and size installed.
3. Spare Fuse Cabinet Keys: Two.

1.7 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Bussmann, a division of Eaton Corporation; _____: www.cooperindustries.com/#sle.

B Littelfuse, Inc; _____: www.littelfuse.com/#sle.

C Mersen; _____: ep-us.mersen.com/#sle.

2.2 APPLICATIONS

A General Purpose Branch Circuits: Class RK1, time-delay.

B Individual Motor Branch Circuits: Class RK1, time-delay.

C In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.

D Primary Protection for Control Transformers: Class CC, time-delay.

2.3 FUSES

A Provide products listed, classified, and labeled as suitable for the purpose intended.

B Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C Provide fuses of the same type, rating, and manufacturer within the same switch.

D Comply with UL 248-1.

E Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F Voltage Rating: Suitable for circuit voltage.

G Class R Fuses: Comply with UL 248-12.

H Class CC Fuses: Comply with UL 248-4.

I Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

J Provide the following accessories where indicated or where required to complete installation:
1. Fuseholders: Compatible with indicated fuses.

2.4 SPARE FUSE CABINET

A Description: Wall-mounted sheet metal cabinet with shelves and hinged door with cylinder lock, suitably sized to store spare fuses and fuse pullers specified.

B Finish: Manufacturer's standard, factory applied grey finish unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B Verify that mounting surfaces are ready to receive spare fuse cabinet.

C Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Do not install fuses until circuits are ready to be energized.

B Install fuses with label oriented such that manufacturer, type, and size are easily read.

C Install spare fuse cabinet where indicated.

D Identify spare fuse cabinet in accordance with Section 26 05 53.

END OF SECTION

SECTION 26 28 16.13 - ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Enclosed circuit breakers.

1.2 RELATED REQUIREMENTS

A Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B Section 26 05 29 - Hangers and Supports for Electrical Systems.

C Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.3 REFERENCE STANDARDS

A FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

I UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:

1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 PERFORMANCE REQUIREMENTS

A Overcurrent Protective Device Coordination for Emergency Systems and Legally Required Standby Systems: All overcurrent protective devices proposed for inclusion in the Work on the Emergency Systems branch (NEC Article 700) and the Legally Required Standby System branch (NEC Article 701) shall be selected to be selectively coordinated with the overcurrent protective devices installed on their supply side such that an overcurrent event (overload, short-circuit, or ground-fault) occurring at the lowest level in the system (branch circuit) cannot cause the feeder protective device supplying the branch circuit panelboard to open. This coordination shall be carried through each level of distribution for both normal and emergency power. See Section 260573 for additional requirements.

B Overcurrent Protective Device Coordination: All overcurrent protective devices proposed for inclusion in the Work shall be selected to be coordinated with the overcurrent protective devices installed on their supply side such that an overcurrent event (overload, short-circuit, or ground-fault) occurring at the lowest level in the system (branch circuit) cannot cause the feeder protective device supplying the branch circuit panelboard to open. This coordination shall be carried through each level of distribution for both normal and emergency power to 0.10 seconds. See Section 260573 for additional requirements.

1.6 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Provide a Specification Compliance Certification in accordance with Section 260120.

C Simultaneous Action Submittals: Enclosed circuit breaker product data submittal shall be made in conjunction with submittal required under Section 260573. The release of electrical equipment submittals is dependent on the receipt of a complete and accurate overcurrent protective device coordination study.

D Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

E Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of enclosed circuit breakers and adjacent equipment with all required clearances indicated.

F Field Quality Control Test Reports.

G Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.7 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

A Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A ABB: www.electrification.us.abb.com/#sle.

B Eaton Corporation: www.eaton.com/#sle.

C Schneider Electric: www.se.com/#sle.

D Siemens Industry, Inc: www.new.siemens.com/#sle.

2.2 ENCLOSED CIRCUIT BREAKERS

A Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B Provide products listed, classified, and labeled as suitable for the purpose intended.

C Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet.
2. Ambient Temperature: Between 23 degrees F and 104 degrees F.

D Short Circuit Current Rating:
1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

E Conductor Terminations: Suitable for use with the conductors to be installed.

F Provide thermal magnetic circuit breakers unless otherwise indicated.

G Provide electronic trip circuit breakers where indicated.

H Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

I Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

J Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1.
   b. Outdoor Locations: Type 3R.
2. Provide surface-mounted enclosures unless otherwise indicated.

K Provide externally operable handle with means for locking in the OFF position.

L Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

M Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

2.3 MOLDED CASE CIRCUIT BREAKERS

A Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B Interrupting Capacity:
1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
   a. 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
   b. 14,000 rms symmetrical amperes at 480 VAC.
2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C Conductor Terminations:
1. Provide mechanical lugs unless otherwise indicated.
2. Lug Material: Copper, suitable for terminating copper conductors only.

D Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

E Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
1. Provide the following field-adjustable trip response settings:
a. Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
b. Long time delay.
c. Short time pickup and delay.
d. Instantaneous pickup.
e. Ground fault pickup and delay where ground fault protection is indicated.

F Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

G Provide the following features and accessories where indicated or where required to complete installation:
1. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

C Verify that mounting surfaces are ready to receive enclosed circuit breakers.

D Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Install products in accordance with manufacturer's instructions.

B Perform work in accordance with NECA 1 (general workmanship).

C Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D Provide required support and attachment in accordance with Section 26 05 29.

E Install enclosed circuit breakers plumb.

F Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G Provide grounding and bonding in accordance with Section 26 05 26.

H Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.

I Set field-adjustable ground fault protection pickup and time delay settings as indicated.

J Identify enclosed circuit breakers in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.

C Perform inspections and tests listed in NETA ATS, Section 7.6.1.1. Tests listed as optional are not required.

D Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E Test shunt trips to verify proper operation.

F Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.4 ADJUSTING

A Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.

B Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 28 16.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A Enclosed safety switches.

1.2 RELATED REQUIREMENTS

A Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B Section 26 05 29 - Hangers and Supports for Electrical Systems.

C Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D Section 26 05 73 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.

E Section 26 28 13 - Fuses.

1.3 REFERENCE STANDARDS

A NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

D NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 PERFORMANCE REQUIREMENTS

A Overcurrent Protective Device Coordination for Emergency Systems and Legally Required Standby Systems: All overcurrent protective devices proposed for inclusion in the Work on the Emergency Systems branch (NEC Article 700) and the Legally Required Standby System branch (NEC Article 701) shall be selected to be selectively coordinated with the overcurrent protective devices installed on their supply side such that an overcurrent event (overload, short-circuit, or ground-fault) occurring at the lowest level in the system (branch circuit) cannot cause the feeder protective device supplying the branch circuit panelboard to open. This coordination shall be carried through each level of distribution for both normal and emergency power. See Section 260573 for additional requirements.

B Overcurrent Protective Device Coordination: All overcurrent protective devices proposed for inclusion in the Work shall be selected to be coordinated with the overcurrent protective devices installed on their supply side such that an overcurrent event (overload, short-circuit, or ground-fault) occurring at the lowest level in the system (branch circuit) cannot cause the feeder protective device supplying the branch circuit panelboard to open. This coordination shall be carried through each level of distribution for both normal and emergency power to 0.10 seconds. See Section 260573 for additional requirements.

1.6 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Provide a Specification Compliance Certification in accordance with Section 260120.

C Simultaneous Action Submittals: Enclosed switch product data submittal shall be made in conjunction with submittal required under Section 260573. The release of electrical equipment submittals is dependent on the receipt of a complete and accurate overcurrent protective device coordination study.

D Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

E Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

F Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.7 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

A Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A ABB: www.electrification.us.abb.com/#sle.

B Eaton Corporation: www.eaton.com/#sle.

C Schneider Electric: www.se.com/#sle.

D Siemens Industry, Inc: www.new.siemens.com/#sle.

E Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.2 ENCLOSED SAFETY SWITCHES

A Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B Provide products listed, classified, and labeled as suitable for the purpose intended.

C Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet.
2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D Horsepower Rating: Suitable for connected load.

E Voltage Rating: Suitable for circuit voltage.

F Short Circuit Current Rating:
1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
2. Minimum Ratings:
   a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
   b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

G Provide with switch blade contact position that is visible when the cover is open.

H Fuse Clips for Fusible Switches: As required to accept fuses indicated.
1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

I Conductor Terminations: Suitable for use with the conductors to be installed.

J Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

K Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

L Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1.
   b. Outdoor Locations: Type 3R.
2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

M Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

N Heavy Duty Switches:
1. Comply with NEMA BS 31047.
2. Conductor Terminations:
   a. Provide mechanical lugs unless otherwise indicated.
   b. Lug Material: Copper, suitable for terminating copper conductors only.
3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C Verify that mounting surfaces are ready to receive enclosed safety switches.

D Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Install products in accordance with manufacturer's instructions.

B Perform work in accordance with NECA 1 (general workmanship).

C Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D Provide required support and attachment in accordance with Section 26 05 29.

E Install enclosed switches plumb.

F Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G Provide grounding and bonding in accordance with Section 26 05 26.

H Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I Identify enclosed switches in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Inspect and test in accordance with NETA ATS, except Section 4.

C Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4 ADJUSTING

A Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 29 13 - ENCLOSED CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A Enclosed NEMA controllers for low-voltage (600 V and less) applications:
1. Magnetic motor starters.
2. General purpose contactors.
3. Manual motor starters.

B Overcurrent protective devices for motor controllers, including overload relays.

C Control accessories:
1. Auxiliary contacts.
2. Pilot devices.
3. Control and timing relays.
4. Control power transformers.

1.2 RELATED REQUIREMENTS

A Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B Section 26 05 29 - Hangers and Supports for Electrical Systems.

C Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.3 REFERENCE STANDARDS

A IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

B NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

E NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.

F NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).

G NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

H NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

J UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

K UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.
3. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.
4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
6. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Provide a Specification Compliance Certification in accordance with Section 260120.

C Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

D Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1.6 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A ABB: www.electrification.us.abb.com/#sle.

B Eaton Corporation: www.eaton.com/#sle.

C Rockwell Automation, Inc: www.rockwellautomation.com/#sle.

D Schneider Electric: www.se.com/#sle.

E Siemens Industry, Inc: www.new.siemens.com/#sle.

F Source Limitations: Provide enclosed motor controllers and associated components produced by single manufacturer and obtained from single supplier.
1. Motor-starting switches without overload protection may be produced by same manufacturer as wiring devices used for project.

2.2 ENCLOSED CONTROLLERS

A Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B Provide products listed, classified, and labeled as suitable for the purpose intended.

C Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.

D Service Conditions:
1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
    a. Altitude:
        1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet.
        2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet.
    b. Ambient Temperature: Between 32 degrees F and 104 degrees F.
2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

E Short Circuit Current Rating:
1. Provide controllers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

F Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

G Conductor Terminations: Suitable for use with the conductors to be installed.

H Enclosures:
1. Comply with NEMA ICS 6.
2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
3. Finish: Manufacturer's standard unless otherwise indicated.

I Instrument Transformers:
1. Comply with IEEE C57.13.
2. Select suitable ratio, burden, and accuracy as required for connected devices.
3. Current Transformers: Connect secondaries to shorting terminal blocks.
4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

J Magnetic Motor Starters: Combination type unless otherwise indicated.
1. Combination Magnetic Motor Starters: NEMA ICS 2, Class A combination motor controllers with magnetic contactor(s), externally operable disconnect and overload relay(s).
2. Configuration: Full-voltage non-reversing unless otherwise indicated.
3. Minimum Starter Size: NEMA Size 0.
4. Disconnects: Circuit breaker type.
    a. Circuit Breakers: Motor circuit protectors (magnetic-only) unless otherwise indicated or required.
    b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
    c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
5. Overload Relays: Bimetallic thermal type unless otherwise indicated.
6. Pilot Devices Required:
    a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings.
    b. Single-Speed, Non-Reversing Starters:
        1) Pushbuttons: START-STOP.
        2) Selector Switches: HAND/OFF/AUTO.

3) Indicating Lights: Red ON, Green OFF.

K General Purpose Contactors: Combination type unless otherwise indicated.
1. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect, but without integral overload relay(s).
2. Configuration: Full-voltage non-reversing unless otherwise indicated.
3. Minimum Contactor Size: NEMA Size 0.
4. Disconnects: Circuit breaker type.
   a. Circuit Breakers: Thermal magnetic unless otherwise indicated or required.
   b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
   c. Provide auxiliary interlock for disconnection of external control power sources where applicable.

L Manual Motor Starters:
1. Description: NEMA ICS 2, Class A manually-operated motor controllers with overload relay(s).
2. Configuration: Non-reversing unless otherwise indicated.
3. Fractional-Horsepower Manual Motor Starters:
   a. Furnish with toggle operator.
   b. Overload Relays: Bimetallic or melting alloy thermal type.

2.3 OVERCURRENT PROTECTIVE DEVICES

A Overload Relays:
1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
3. Trip-free operation.
4. Visible trip indication.
5. Resettable.
   a. Employ manual reset unless otherwise indicated.
   b. Do not employ automatic reset with two-wire control.
6. Bimetallic Thermal Overload Relays:
   a. Interchangeable current elements/heaters.
   b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
   c. Trip test function.
7. Melting Alloy Thermal Overload Relays:
   a. Interchangeable current elements/heaters.
8. Solid-State Overload Relays:
   a. Adjustable full load current.
   b. Phase loss protection.
   c. Phase imbalance protection.
   d. Ambient temperature insensitive.
   e. Thermal memory.
   f. Trip test function.
   g. Provide isolated alarm contact.

B Circuit Breakers:
1. Interrupting Capacity (not applicable to motor circuit protectors):
   a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
   b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

2. Motor Circuit Protectors:
   a. Description: Instantaneous-trip circuit breakers furnished with magnetic instantaneous tripping elements for short circuit protection, but not with thermal inverse time tripping elements for overload protection; UL 489 recognized only for use as part of a listed combination motor controller with overload protection; ratings, configurations, and features as indicated on the drawings.
   b. Provide field-adjustable magnetic instantaneous trip setting.
   c. Provide the following features and accessories where indicated or where required to complete installation:
      1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
      2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.
      3) Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
3. Molded Case Circuit Breakers:
   a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.
      1) Provide thermal magnetic circuit breakers unless otherwise indicated.
      2) Provide electronic trip circuit breakers where indicated.
   b. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   c. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
      1) Provide the following field-adjustable trip response settings:
         (a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
         (b) Long time delay.
         (c) Short time pickup and delay.
         (d) Instantaneous pickup.
         (e) Ground fault pickup and delay where ground fault protection is indicated.
   d. Provide the following features and accessories where indicated or where required to complete installation:
      1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
      2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.
      3) Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.

2.4 CONTROL ACCESSORIES

A Auxiliary Contacts:
1. Comply with NEMA ICS 5.
2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each magnetic motor starter, minimum.

B Pilot Devices:
1. Comply with NEMA ICS 5; heavy-duty type.
2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
4. Indicating Lights: Push-to-test type unless otherwise indicated.
5. Provide LED lamp source for indicating lights and illuminated devices.

C Control and Timing Relays:
1. Comply with NEMA ICS 5.
2. Provide number and type of relays indicated or required to perform necessary functions.

D Control Power Transformers:
1. Size to accommodate burden of contactor coil(s) and all connected auxiliary devices.
2. Include primary and secondary fuses.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that ratings of enclosed controllers are consistent with the indicated requirements.

C Verify that mounting surfaces are ready to receive enclosed controllers.

D Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Install products in accordance with manufacturer's instructions.

B Install controllers in accordance with NECA 1 (general workmanship).

C Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D Provide required support and attachment in accordance with Section 26 05 29.

E Install enclosed controllers plumb and level.

F Provide grounding and bonding in accordance with Section 26 05 26.

G Install all field-installed devices, components, and accessories.

H Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

I Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.

J Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.

K Identify enclosed controllers in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Inspect and test in accordance with NETA ATS, except Section 4.

C Motor Starters: Perform inspections and tests listed in NETA ATS, Section 7.16.1.1. Tests listed as optional are not required.

D Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers larger than 225 amperes. Tests listed as optional are not required.

E Correct deficiencies and replace damaged or defective enclosed controllers or associated components.

3.4 ADJUSTING

A Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.

B Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 43 13 - SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SUMMARY

A Section includes field-mounted SPD for low-voltage (120 to 600 V) power distribution and control equipment.

B Related Requirements:
1. Section 26 2413 Switchboards for field installed SPDs.
2. Section 26 2416 Panelboards for field installed SPDs.

1.2 DEFINITIONS

A ATS: Acceptance Testing Specifications.

B I-nominal: Nominal discharge current.

C MCOV: Maximum continuous operating voltage.

D MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E OCPD: Overcurrent protective device.

F SCCR: Short-circuit current rating.

G SVR: Suppressed voltage rating.

H SPD: Surge Protective Device(s), both singular and plural; also, transient voltage surge suppression.

I VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

A Submit product data and shop drawings in accordance with Division 01 and Division 26 Section “Electrical Shop Drawings and Submittals” for products specified under PART 2 - PRODUCTS.

B Specification Compliance Certification: Submit a Specification Compliance Certification in accordance with Division 26 Section “Electrical Shop Drawings and Submittals”.

C Product Data: For each type of product indicated. Include rated capacities, clamp times, physical construction, operating weights, electrical characteristics, furnished specialties, and accessories. Include UL 1449, 5th Edition Listing documentation verifying:
1. Short Circuit Current Rating (SCCR).
2. Voltage Protection Ratings (VPRs) for all modes.
3. Maximum Continuous Operating Voltage rating (MCOV). The MCOV shall be a tested value per UL 1449 5th Edition, section 37.7.3. MCOV values based solely on the components used in the construction of the SPD will not be accepted.
4. I-nominal rating (I-n).
5. Type 1 or Type 2 Device Listing.
6. Manufacturer shall provide written test report showing the SPD can survive a single surge at its raged value without the use of circuit breakers or fuses. Single surge ratings based on the sum of components used in the construction of the SPD will not be acceptable.
7. kA rating per phase.
8. kA rating per mode.

D Warranty: Special warranty specified in this Section.

1.4 INFORMATIONAL SUBMITTALS

A Qualification Data: For qualified testing agency.

B Product Certificates: For SPD devices, from manufacturer.

C Field quality-control reports.

D Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A Operation and Maintenance Data: For SPD devices to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.

B Comply with IEEE C62.41.2 and test devices according to IEEE C62.45.

C Comply with NEMA LS 1.

D Comply with UL 1449, 4th Edition.

E Comply with NFPA 70.

1.7 PROJECT CONDITIONS

A Service Conditions: Rate SPD devices for continuous operation under the following conditions unless otherwise indicated:
1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
2. Operating Temperature: 30 to 120 deg F.
3. Humidity: 0 to 85 percent, noncondensing.
4. Altitude: Less than 20,000 feet above sea level.

1.8 COORDINATION

A Coordinate location of field-mounted SPD devices to allow adequate clearances for maintenance.

1.9 WARRANTY

A Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Fifteen (15) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SERVICE ENTRANCE SUPPRESSORS (TYPE A)

A Manufacturers: Subject to compliance with requirements, provide comparable product to the following:
1. ABB Current Technology "SL3" Series.

B Surge Protection Devices (SPDs):
1. Listed as Type 1 SPD per UL 1449, 5th Edition.
2. SPD shall have the following features and accessories:
a. Integral disconnect switch.
b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

c. Indicator light display for protection status.
d. Form C contacts: one normally open and one normally closed, for remote monitoring of protection status, and advanced monitoring with status, surge counter and history log of events.

C Comply with UL 1283 with a maximum attenuation of 54 dB based on 50 ohm insertion loss test per MIL-STD-220B.
1. Modular design (with field-replaceable modules).
2. Internal Device Overcurrent Protection (Fuses): All protection modes (including Neutral to Ground) of each surge suppression device shall be internally fused at the component level with fuse I2T capability allowing the suppressor's maximum rated transient current to pass through the suppressor without fuse operation. If the rated I2T characteristic of the fusing is exceeded, the fusing shall be capable of opening in less than one millisecond and clear both high and low impedance fault conditions. The fusing shall be capable of interrupting up to 200 kA symmetrical fault current with 600 VAC applied. This overcurrent protection circuit shall be monitored to provide indication of suppression failure. Conductor level fuses or circuit breakers internal or external to the surge suppression units are not acceptable as meeting this requirement.
3. Each MOV shall be individually fuse protected to avoid cascading faults.
4. Fabrication using bolted compression lugs for internal wiring.
5. Integral disconnect switch.
6. Redundant suppression circuits.
7. Redundant replaceable modules.
8. Arrangement with copper bus bars and for bolted connections to phase buses, neutral bus, and ground bus.
9. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
10. LED indicator lights for power and protection status.
11. Audible alarm, with silencing switch, to indicate when protection has failed.
12. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
13. Six-digit transient-event counter set to totalize transient surges.

D Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall not be the arithmetic sum of the ratings of the individual MOVs in a given mode. SPD manufacturer shall provide independent third party testing validating unit is capable of surviving a single surge at the specified rating or up to and not to exceed 200 kA.

E Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, 3-phase, 4-wire circuits shall not exceed the following:
1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Line to Line: 1800 V for 480Y/277 V.
4. Neutral to Ground: 1200V for 480Y/277 V.

F Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, 3-phase, 4-wire circuits shall not exceed the following:
1. Line to Neutral: 700 V for 208Y/120 V.
2. Line to Ground: 700 V for 208Y/120 V.
3. Line to Line: 1200 V for 208Y/120 V.
4. Neutral to Ground: 700 V for 208Y/120 V.

G SCCR: Equal or exceed 200 kA.

H I-nominal Rating: UL labeled with 20 kA nominal for compliance with UL 96A Lightning Protection Master Label and NFPA 780.

I Repetitive Surge: SPD shall survive a minimum of 14,000 repetitive category C3 (20kV/10kA) surges with no more than 10-percent deterioration. Calculated repetitive surge values will not be accepted. SPD manufacturer shall provide repetitive surge test report.

J Temporary Over Voltages: SPD shall be able to prevent common temporary over voltages from damaging the MOVs, increasing longevity and ability of SPD unit to protect the critical load.

2.2 SWITCHBOARD AND PANELBOARD SUPPRESSORS (TYPES B AND C)

A Manufacturers: Subject to compliance with requirements, provide comparable products by the following:
1. ABB Current Technology "TG3" Series.

B Surge Protection Devices (SPDs):
1. Listed as Type 2 SPD per UL 1449, 4th Edition.
2. Include LED indicator lights for power and protection status.
3. Internal thermal protection.
4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
5. Four-digit transient-event counter set to totalize transient surges.

C Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 150 kA (Type B) and 50 kA (Type C). The peak surge current rating shall not be the arithmetic sum of the ratings of the individual MOVs in a given mode. SPD manufacturer shall provide independent third party testing validating unit is capable of surviving a single surge at the specified rating.

D Comply with UL 1283 with a maximum attenuation of 34 dB based on 50 ohm insertion

E Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V or 208Y/120 V, 3-phase, 4-wire circuits shall not exceed the follows:
1. Line to Neutral: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
3. Neutral to Ground: 1000 V for 480Y/277 V and 700 V for 208Y/120 V.
4. Line to Line: 2000 V for 480Y/277 V and 1200 V for 208Y/120 V.

F SCCR: Equal or exceed 100 kA.

2.3 ENCLOSURES

A Indoor Enclosures: NEMA 250 Type 1.

B Outdoor Enclosures: NEMA 250 Type 3R.

2.4 CONDUCTORS AND CABLES

A Power Wiring: SPD shall be equipped with mechanical lugs that can accept up to #2 AWG wire. Conductors between SPD and switchboard shall be "High Performance Interconnect" (HPI) cables with Ultra Low impedance characteristics at 10 kHz and above.

B Class 2 Control Cable: Multi-conductor cable with copper conductors not smaller than #18 AWG, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

C Class 1 Control Cable: Multi-conductor cable with copper conductors not smaller than #14 AWG, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 EXECUTION

3.1 INSTALLATION

A Install service entrance SPD devices (Type A) at service entrance on load side, with ground lead bonded to service entrance ground.

1. Provide direct tap off load side of main bus in switchboard. Utilize #2/0 AWG wire for connection to switchboard with maximum wire length of three feet.

B Install SPD devices for switchboards (Type B) on load side and maintain point of attachment as short and straight as possible. Adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground. If installed lead length must exceed 10-feet, SPD manufacturer shall provide a low impedance cable that improves the installed performance.

1. Provide 100-A circuit breaker as a dedicated disconnecting means for SPD unless otherwise indicated. Utilize #2 AWG wire for connection to panelboard with maximum wire length of three feet.

C Install SPD devices for panelboards and auxiliary panels (Type C) on load side and maintain attachment as short and straight as possible. Adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground. If installed lead length must exceed 10-feet, SPD manufacturer shall provide a low impedance cable that improves the installed performance.

1. Provide 60-A circuit breaker as a dedicated disconnecting means for SPD unless otherwise indicated. Utilize #6 AWG wire for connection to panelboard with maximum wire length of three feet.

D Use crimped connectors and splices only. Wire nuts are unacceptable.

3.2 FIELD QUALITY CONTROL

A Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

1. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.
2. After installing SPD devices but before electrical circuitry has been energized, test for compliance with requirements.
    a. Off-line Testing: Impulse injection to verify the system tolerates as well as verification of proper facility neutral-to-ground bond. Compare field test results to factory benchmark test parameters supplied with each individual unit.
    b. On-line Testing: Verify that suppression and filtering paths are operating at 100% protection as well as verification of proper facility neutral-to-ground bond by measuing neutral-to-ground current and voltage and by visual inspection.
    c. Voltage measurements from Line-to-Ground (L-G), Line-to-Neutral (L-N), Line-to-Line (L-L), and Neutral-to-Ground (N-G), taken at the time of the testing procedure.
3. Complete startup checks according to manufacturer's written instructions.

D SPD will be considered defective if it does not pass tests and inspections.

E Prepare test and inspection reports.

1. Record results of field testing and compare to factory benchmark test parameters supplied with each individual surge protective device. Indicate that the integrity of neutral-to-ground bonds were verified through testing and visual inspection, and that grounding bonds were observed to be in place.
2. Submit to the Owner's representative and to the Architect/Engineer copies of the startup test results and the factory benchmark testing results for confirmation of proper suppression filter system function.

3.3 STARTUP SERVICE

A Complete startup checks according to manufacturer’s written instructions.

B Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C Do not energize or connect service entrance equipment or panelboards to their sources until SPD devices are installed and connected.

END OF SECTION

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A Interior luminaires.

B Exit signs.

C Ballasts and drivers.

D Accessories.

1.2 RELATED REQUIREMENTS

A Section 26 05 29 - Hangers and Supports for Electrical Systems.

B Section 26 05 33.16 - Boxes for Electrical Systems.

C Section 26 09 23 - Lighting Control Devices.

D Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.

1.3 REFERENCE STANDARDS

A IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

B IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

C NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.

D NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

E NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).

F NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

I UL 1598 - Luminaires; Current Edition, Including All Revisions.

J UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.

4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Shop Drawings:
1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
1. LED Luminaires:
a. Include estimated useful life, calculated based on IES LM-80 test data.

D Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

B Luminaires shall be DLC listed or Energy Star rated.

1.7 DELIVERY, STORAGE, AND PROTECTION

A Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 WARRANTY

A See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B The equipment items shall be supporteed by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.
1. All light fixtures/luminaires and controls shall have an unconditional 10-year warranty. Light fixtures, lamps, drivers, finishes, and all components shall be free from defects in materials and workmanship for a period of ten (10) years from date of Owner's acceptance. Replace of light fixtures and cost of labor shall be the responsibility of the Contractor.
2. Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shlal be in addition to, and run concurrently with, other warranties made by the Contractor under requirements of the Contract Documents.
3. Light fixtures and assocaited equipment shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.
4. Furnish the electronic LED driver manufacturer's warranty. The warrenty period shall not be less than ten (10) years from the date of substantial completion of the electronic LED driver. The warranty shall state the malfunctioning LED driver shall be exchanged by the manufacturer and promptly shipped to the Owner. The replacement LED driver shall be identical to, or an improvement upon, the original design of the malfunctioning LED driver.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A Furnish products as indicated in luminaire schedule included on the drawings.

B Manufacturers:
1. Subject to compliance with requirements, provide one of the products indicated on Light Fixture Schedule. Refer to Light Fixture Schedule for manufacturers and model numbers. Basis of design for each type shall be the first fixture manufacturer and model number listed for each type.
2. Manufacturer's catalog numbers together with the descriptions on the drawings and these specifications are indicative of required design, appearance, quality and performance. Refer any discrepancies between any of these to the Engineer for resolution prior to bid. In absence of such notice to the Engineer, provide the greater requirement as directed by the Engineer, without additional cost.

2.2 LUMINAIRES

A Provide products that comply with requirements of NFPA 70.

B Provide products that are listed and labeled as complying with UL 1598, where applicable.

C Provide products listed, classified, and labeled as suitable for the purpose intended.

D Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G Color rendering index (CRI) shall be 80 (minimum).

H Correlated color temperature (CCT) shall be 4000K or as indicated on light fixture schedule.

I Recessed Luminaires:
1. Ceiling Compatibility: Comply with NEMA LE 4.

J Suspended Luminaires:
1. Provide hangers capable of supporting twice the combined weight of fixtures supported by hangers.
2. Provide with swivel hangers to ensure a plumb installation.
3. Hangers shall be cadmium-plated steel with swivel-ball tapped for the conduit size indicated.
4. Hangers shall allow fixtures to swing within an angle of 45 degrees. Brace pendants 4-feet or longer to limit swinging.
5. Single-unit suspended fixtures shall have twin-stem hangers.
6. Multiple-unit or continuous row fixtures shall have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end.
7. Rods shall be a minimum 0.18-inch diameter.

K LED Luminaires:
1. Components: UL 8750 recognized or listed as applicable.
2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 100,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

L LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
1. LED Tape - General Requirements:

a. Listed.
b. Designed for field cutting in accordance with listing.

M Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.3 EXIT SIGNS

A Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
1. Number of Faces: Single- or double-face as indicated or as required for installed location.
2. Directional Arrows: As indicated or as required for installed location.

B Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
1. Self-Powered Exit Signs:
a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
b. Battery: Sealed, maintenance-free, nickel cadmium unless otherwise indicated.
c. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
d. Provide low-voltage disconnect to prevent battery damage from deep discharge.
e. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

C Accessories:
1. Provide compatible accessory wire guards where indicated.

2.4 BALLASTS AND DRIVERS

A Ballasts/Drivers - General Requirements:
1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
3. Driver shall comply with UL 1310 Class 2 requirements for dry and damp locations, NFPA 70 unless specified otherwise. Drivers shall be designed for the wattage of the LEDs used in the indicated application. Drivers shall be designed to operate on the voltage system to which they are connected.
4. Power factor shall be 0.95 (minimum).
5. Class A sound rating.
6. Current crest factor of 1.5 or less.
7. Total harmonic distortion (THD) shall be 20 percent (maximum).

B Dimmable LED Drivers:
1. Dimming Range: Continuous dimming from 100 percent to one percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.
a. Wall Dimmers: See Section 26 27 26.
b. Daylighting Controls: See Section 26 09 23.

2.5 ACCESSORIES

A Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C Verify that suitable support frames are installed where required.

D Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B Install products in accordance with manufacturer's instructions.

C Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D Provide required support and attachment in accordance with Section 26 05 29.

E Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F Suspended Ceiling Mounted Luminaires:
1. Do not use ceiling tiles to bear weight of luminaires.
2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
3. Secure recessed luminaires to building structure.
4. Secure pendant-mounted luminaires to building structure.
5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
6. In addition to ceiling support wires, provide four galvanized steel safety wire(s), minimum 12 gauge, connected from each corner of each recessed luminaire to building structure.

G Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.

H Suspended Luminaires:
1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
2. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 6 feet between supports.
3. Install canopies tight to mounting surface.
4. Unless otherwise indicated, support pendants from swivel hangers.

I Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

J Install accessories furnished with each luminaire.

K Bond products and metal accessories to branch circuit equipment grounding conductor.

L Exit Signs:
1. Unless otherwise indicated, connect unit to unswitched power from circuit indicated. Bypass local switches, contactors, or other lighting controls.

3.3 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Inspect each product for damage and defects.

C Operate each luminaire after installation and connection to verify proper operation.
1. For electronic dimming drivers, test for full range of dimming capability. Observe for visually detectable flicker over full dimming range.

D Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

E Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.4 ADJUSTING

A Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.5 CLEANING

A Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.6 PROTECTION

A Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A Exterior luminaires.

B Ballasts and drivers.

C Poles and accessories.

1.2 RELATED REQUIREMENTS

A Section 26 05 29 - Hangers and Supports for Electrical Systems.

B Section 26 05 33.16 - Boxes for Electrical Systems.

C Section 26 28 13 - Fuses.

1.3 REFERENCE STANDARDS

A IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

B IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

C IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

D NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

F NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G UL 1598 - Luminaires; Current Edition, Including All Revisions.

H UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination:
1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B Shop Drawings:
1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:
   a. Include estimated useful life, calculated based on IES LM-80 test data.
2. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

D Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.

E Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.6 QUALITY ASSURANCE

A Comply with requirements of NFPA 70.

B Provide luminaires from a single manufacturer for each luminaire type.

C Luminaires shall be DLC

1.7 DELIVERY, STORAGE, AND HANDLING

A Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 WARRANTY

A See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B The equipment items shall be supporteed by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.
1. All light fixtures/luminaires and controls shall have an unconditional 10-year warranty. Light fixtures, lamps, drivers, finishes, and all components shall be free from defects in materials and workmanship for a period of ten (10) years from date of Owner's acceptance. Replace of light fixtures and cost of labor shall be the responsibility of the Contractor.
2. Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shlal be in addition to, and run concurrently with, other warranties made by the Contractor under requirements of the Contract Documents.
3. Light fixtures and assocaited equipment shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.
4. Furnish the electronic LED driver manufacturer's warranty. The warrenty period shall not be less than ten (10) years from the date of substantial completion of the electronic LED driver. The warranty shall state the malfunctioning LED driver shall be exchanged by the manufacturer and promptly shipped to the Owner. The replacement LED driver shall be identical to, or an improvement upon, the original design of the malfunctioning LED driver.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A Furnish products as indicated in luminaire schedule included on the drawings.

B Manufacturers:
1. Subject to compliance with requirements, provide one of the products indicated on Light Fixture Schedule. Refer to Light Fixture Schedule for manufacturers and model numbers. Basis of design for each type shall be the first fixture manufacturer and model number listed for each type.

2. Manufacturer's catalog numbers together with the descriptions on the drawings and these specifications are indicative of required design, appearance, quality and performance. Refer any discrepancies between any of these to the Engineer for resolution prior to bid. In absence of such notice to the Engineer, provide the greater requirement as directed by the Engineer, without additional cost.

2.2 LUMINAIRES

A Provide products that comply with requirements of NFPA 70.

B Provide products that are listed and labeled as complying with UL 1598, where applicable.

C Provide products listed, classified, and labeled as suitable for the purpose intended.

D Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H Color rendering index (CRI) shall be 80 (minimum).

I Correlated color temperature (CCT) shall be 3000K or as indicated on light fixture schedule.

J LED Luminaires:
1. Components: UL 8750 recognized or listed as applicable.
2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 100,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

K LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
1. LED Tape - General Requirements:
   a. Listed.
   b. Designed for field cutting in accordance with listing.
   c. Wet Location Applications: IEC 60529, IP 68 (waterproof) rated.

L Exposed Hardware: Stainless steel.

2.3 BALLASTS AND DRIVERS

A Ballasts/Drivers - General Requirements:
1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B Dimmable LED Drivers:
1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.4 MATERIALS

A Metal Parts: Free of burrs and sharp corners and edges.

B Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

C Door, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping witout use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

E Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

F Housings:
1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

2.5 FINISHES

A Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components area acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

B Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium Satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.
a. Color: Verify color with Architect.

2.6 POLES

A All Poles:
1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
2. Material: Concrete, unless otherwise indicated.
3. Shape: Square tapered, unless otherwise indicated.
4. Mounting Height: 30-feet, unless otherwise indicated.
5. Mounting: Direct bury, unless otherwise indicated.
6. Unless otherwise indicated, provide with the following features/accessories:
a. Handhole.

PART 3 EXECUTION

3.1 EXAMINATION

A Verify that field measurements are as indicated.

B Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C Verify that suitable support frames are installed where required.

D Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B Install products in accordance with manufacturer's instructions.

C Install luminaires in accordance with NECA/IESNA 501.

D Provide required support and attachment in accordance with Section 26 05 29.
1. Supports:
   a. Sized and rated for luminaire weight.
   b. Able to maintain luminaire position after cleaning.
   c. Support luminaires without causing deflection of finished surface.
   d. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E Coordinate layout and installation of luminaires with other construction.

F Adjust luminaires that require field adjustment or aiming.

G Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

H Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

I Pole-Mounted Luminaires:
1. Embedded Poles: Install poles plumb as indicated.
2. Grounding:
   a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
3. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
4. Install non-breakaway in-line fuse holders and fuses complying with Section 26 28 13 in pole handhole or transformer base for each ungrounded conductor.

J Install accessories furnished with each luminaire.

K Bond products and metal accessories to branch circuit equipment grounding conductor.

3.3 FIELD QUALITY CONTROL

A See Section 01 40 00 - Quality Requirements, for additional requirements.

B Inspect each product for damage and defects.

C Operate each luminaire after installation and connection to verify proper operation.

D Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.4 ADJUSTING

A Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.5 CLEANING

A Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

END OF SECTION

SECTION 27 00 10 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEM

PART 1 - GENERAL

1.1 Summary

A. This Division and the associated Drawings, Addenda (when issued), and Contract Documents, identifies the requirements, technical design, and specifications for Communications Systems at Fort Bend ISD Willowridge High School located in Houston, Texas.

B. Functionally complete Communications Systems shall be provided in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result shall be provided whether or not specifically called for, at no additional cost to Owner.

C. The Communications Systems include the following:
1. Structured Cabling System
2. And the associated pathways for the systems listed above.

1.2 Related Sections

A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 1 apply to the work specified in Division 27 and shall be complied with in every respect. The Contractor shall examine all of the items which make up the Contract Documents and shall coordinate them with the work on the project.

B. Refer to Division 26 for Electrical System requirements.

A. Refer to Division 28 for Electronic Security requirements.

1.3 Confidentiality

A. Limit access to physical and electronic versions of these Division 27 specifications and associated Drawings to individuals directly involved in performing the Work.

B. At the conclusion of the Project, cross-shred any physical (paper) copies of both drawings and specifications before disposal.

1.4 Abbreviations

A. ADA – Americans with Disabilities Act

B. AFF – above finished floor

C. AHJ – authority having jurisdiction

D. ANSI – American National Standards Institute

E. AV – audiovisual

F. BOM – bill of materials

G. CAT – category

H. CATV – cable television

I. CD – Construction Document

J. DAS – distributed antenna system

K. EMI – electromagnetic interference

L. EMT – electrical metallic tubing

M. ERRC – emergency responder radio coverage

N. FACP – fire alarm control panel

O. FCC – Federal Communications Commission

P. F/UTP – foiled, unshielded twisted pair
Q. GC – general contractor; Contractor
R. GMP – guaranteed maximum price
S. GUI – graphical user interface
T. HVAC – heating, ventilation, and air-conditioning
U. IBC – International Building Code
V. ICT – information and communications technology
W. IDF – intermediate distribution frame; a secondary Communications Room in a building
X. IMC – intermediate metal conduit
Y. ISO – International Organization for Standardization
Z. ISP – inside plant
AA. ISP – Internet service provider
BB. IT – information technology
CC. LAN – local area network
DD. MDF – main distribution room; the primary/main Communications Room for a building
EE. MPOE – minimum point of entry
FF. MTBF – mean time between failures
GG. NEC – National Electric Code
HH. NEMA – National Electrical Manufacturers Association
II. NFPA – National Fire Protection Association
JJ. NRTL – nationally recognized testing laboratory
KK. OEM – original equipment manufacturer
LL. OSP – outside plant
MM. PoE – power over Ethernet
NN. POS – point of sale
OO. POTS – plain old telephone service
PP. RF – radio frequency
QQ. RFI – request for interpretation/information
RR. RMC – rigid metal conduit
SS. RU – rack unit
TT. ScTP – screened twisted pair
UU. STP – shielded twisted pair
VV. TIA – Telecommunications Industry Association
WW. TR – telecommunications room
XX. U/FTP – unshielded twisted-pair cable with foil screened twisted-pair conductors
YY. UL – Underwriters Laboratory
ZZ. UPS – uninterruptible power supply
AAA. USB – universal serial bus
BBB. UTP – unshielded twisted pair
CCC. VLAN – virtual LAN

DDD. VPN – virtual private network

EEE. WAN – wide area network

FFF. WAP – wireless access point

GGG. WLAN – wireless LAN

1.5 Definitions

A. Wherever used in the Division 27 specifications or associated drawings and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. If any of these terms are defined in the General Conditions in Division 1, those definitions shall take precedence.

1. Addenda – written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
2. Bid – the offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
3. Bidder – the individual or entity who submits a Bid directly to Owner.
4. Bidding Documents – the Bidding Requirements and the proposed Contract Documents (including all Addenda).
5. Bidding Requirements – The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
6. Change Order – A document recommended by Design Consultant which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
7. Communication(s) Room – A generic term for a dedicated room for information technology equipment, frequently referred to as Telecommunications Room, Telecom Room, IDF, MDF, IT Room, or Equipment Room.
8. Contract – The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
9. Contract Documents – Those items so designated in the agreement between Owner and Contractor covering the Work.
    a. The Contract Documents are complementary; what is required by one is as binding as if required by all.
10. Contractor – The individual or entity with whom Owner has entered into the Agreement.
11. Design Consultant – the design firm responsible for creation of these Division 27 specifications and associated Drawings – COMBS Consulting Group LP.
    a. Except for the following Work, where a third-party is responsible:
        1) <insert names of other Division 27 consultants and their associated specification sections and drawing series>
12. Drawings – The part of the Contract Documents prepared or approved by Design Consultant which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
13. General Requirements – Sections of Division 1 of the Specifications.
14. Laws and Regulations – Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

15. Notice to Proceed – a written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
16. Owner – the individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
17. Project – the total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
18. Samples – physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which established the standards by which such portion of the Work will be judged.
19. Seismic Design Category – a category from ASCE 07 assigned to a structure based on its occupancy category and the severity of the design earthquake ground motion at the Project Site.
20. Shop Drawings – all drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
21. Site – lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of the Contractor.
22. Specifications – the part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
23. Subcontractor – an individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
24. Substantial Completion – the time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of the Architect/Design Consultant, the Work is sufficiently complete, in accordance with the Contract Documents, so that the Work can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
25. Supplementary Conditions – the part of the Contract Documents which amends or supplements these General Conditions.
26. Supplier – A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
27. Underground Facilities – all underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
28. Work – the entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

B. Terminology

29. The words and terms below are not defined, but when used in Division 27 specifications and related Drawings, have the indicated meaning:

a. Intent of Certain Terms and Adjectives:

1) The Contract Documents include the terms “as allowed,” “as approved,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Design Consultant. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Design Consultant as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Design Consultant any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the following provisions or any other provision of the Contract Documents.

a) Limitations on Design Consultant’s Authority and Responsibilities

i) Design Consultant will not supervise, direct, control, or have authority over or be responsible for Contractor’s means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Design Consultant will not be responsible for Contractor’s failure to perform the Work in accordance with the Contract Documents.

ii) Design Consultant will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

b. Day – the word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

c. Defective – the word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:

1) Does not conform to the Contract Documents; or
2) Does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
3) Has been damaged prior to Substantial Completion.

d. Furnish – the word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

e. Install – the word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

f. Provide – the word “provides” and “perform,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

g. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied, and those services, materials and equipment shall be furnished and installed.

C. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contractor Documents in accordance with such recognized meaning.

D. Refer to individual sections for additional definitions.

E. Reference Standards

F. Standards, Specifications, Codes, Laws, and Regulations

30. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated in the Contract Documents.

31. For referenced standards and guidelines that have not been adopted into code or law, the most recent version / edition of the standard and guideline shall be followed, except for the following:

    a. where the Contract Documents clearly establish size, quantity, and/or quality of services, materials, or equipment and/or the means, methods, techniques, sequences, or procedures of construction; in these instances, Contract Documents requirements shall take precedence.

32. Whenever the Contract Documents details a requirement that violates an adopted code, law or regulation, submit RFI to Architect/Design Consultant prior to Bid or performing the Work.

G. Codes and Regulations

33. The following codes, laws and regulations are known to have requirements that affect Communications Systems and are listed here for reference. Refer to Part 1 Coordination paragraph in this section for requirements when there are any discrepancies between these codes, laws and regulations and the Contract Documents.

    a. 2010 ADA Standards for Accessible Design

    b. ASCE 07 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures

    c. FCC Rules and Regulations

    d. National Electric Safety Code

    e. NFPA 70 – National Electric Code

    f. NFPA 72 – National Fire Alarm and Signaling Code

    g. NFPA 99 – Health Care Facilities Code

    h. NFPA 101 – Life Safety Code

    i. 2012 Texas Accessibility Standards

34. Refer to individual sections for additional requirements.

H. Quality Assurance

I. Contractor Qualifications

35. Refer to individual sections for requirements.

J. Personnel Qualifications

36. At all times during the progress of the Work, Contractor or Subcontractor shall assign a competent Project Manager who shall not be replaced without written notice to Owner and Design Consultant except under extraordinary circumstances.

37. Refer to individual sections for additional requirements.

K. Warranty

L. Contractor’s General Warranty and Guarantee

38. If the General Requirements do not establish Contractor's General Warranty and Guarantee, then the following requirements are in effect for Communications Systems Work:
    a. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Design Consultant and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
    b. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
        1) abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
        2) normal wear and tear under normal usage.
    c. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
        1) observations by Design Consultant.
        2) recommendation by the Architect/Design Consultant or payment by Owner of any progress or final payment.
        3) the issuance of a certificate of Substantial Completion by Architect/Design Consultant or any payment related thereto by Owner.
        4) use or occupancy of the Work or any part thereof by Owner.
        5) any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Design Consultant;
        6) any inspection, test, or approval by others; or
        7) any correction of defective Work by Owner.

M. Manufacturer Warranty

39. Refer to individual sections for additional requirements.

N. Special Warranty

40. Refer to individual sections for additional requirements.

O. Submittals

P. General Submittal Requirements:

41. Refer to General Requirements (Division 1) for general submittal requirements. Refer to individual sections in Division 27 for additional requirements.

42. Submittals and Shop Drawings shall not utilize the Design Consultant's logo, stamp, or the title block from the Construction Drawings; if either of these are submitted, the Submittal(s) will be rejected without review.

43. Inadequate or Incomplete Submittals and/or Shop Drawings will not be reviewed and will be returned to the Contractor.

Q. Pre-Bid

44. Pre-Bid submittals can generally include:
    a. Clarifying questions.
    b. Product Substitution requests.
    c. Contractor and personnel qualification documentation.

45. Refer to individual sections for specific Pre-Bid requirements.

R. Bid

46. Refer to General Requirements for Bid Form and other requirements.
47. Refer to individual sections for additional Division 27 requirements due with Bid, which may include – but is not limited to – the following:
    a. Contractor and personnel qualification documentation
    b. Unit Pricing
    c. Allowance(s)

S. Pre-Construction

48. Procedures:
    a. Before submitting Pre-Construction submittals, Contractor shall have:
        1) reviewed and coordinated each Shop Drawing with other Shop Drawings and with the requirements of the Work and the Contract Documents.
        2) determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto.
        3) determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
        4) determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions, pre-construction meeting, and programs incident thereto.
    b. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
    c. With each submittal, Contractor shall give Design Consultant specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separates from the Shop Drawings or submittal; and, in addition, by a specific notation made on each Shop Drawing submitted to Design Consultant for review and approval of each such variation.
    d. Design Consultant's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents.
    e. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Architect/Design Consultant.
    f. Contractor shall not install any equipment until pre-construction meeting with Architect/Design Consultant/FBISD IT Department
    g. Contractor shall ensure submittals are submitted in a timely manner to ensure all products can be ordered and received on site in order to not cause any delays. If there are any concerns with any products having long lead times, those products shall be clearly identified in writing so the review and approval can be expedited.
    h. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e., product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product certifications for installers, etc.). Submittals not in the proper sequence will be returned unreviewed.
49. Bill-of-Materials / Product Index

a. Provide a typed listed with each product/equipment being provided as part each Section. List shall include the following, in the exact same order as listed in Division 27 specifications:

1) Product/Equipment specification name
2) Manufacturer
3) Model name
4) Model number

50. Product Data

a. Provide product data sheet for each material, equipment, device, etc. listed in Part 2 of these specifications. Data sheet shall include manufacturer name, product name, part number and relevant product specifications in an 8.5”x11” PDF format.

b. For product data sheets containing more than one (1) part number or product, the Contractor shall clearly identify the specific part number or product being submitted. Product data sheets without the part number clearly identified may not be approved.

51. Shop Drawings

a. Shop Drawings shall include the following:

1) Contractor or Subcontractor’s titleblock; drawing size shall match Construction Drawings (ie 30” x 42”). Titleblock shall include:

a) Project name and address

b) Contractor/Subcontractor company name and contact information.

c) Name and contact information of Contractor/Subcontractor’s Project Manager.

2) Shop Drawings shall be produced in Revit, AutoCAD 2013 or higher.

a) No scanned copy

b) Both construction and graphics room number

c) Reference related spec section for additional requirements

3) Legend page with all symbols defined.
4) Floors plans (minimum scale of 1/8” = 1’-0”) for all areas with Division 27 Work. Floor plans shall include north arrow, keyplan, and indicate device/equipment locations, and associated pathway routing and size.
5) Enlarged plans (minimum scale of 1/4" = 1’-0”) and rack and wall elevations for Communications Rooms, Equipment Rooms, etc., indicating exact location where equipment is intended to be installed. Enlarged plans shall include north arrow.
6) Riser diagrams, details, coordination views, etc. to indicate Contractor has a full understanding of required Work and is coordinated with other trades.

b. Where installation location is critical – such as in Communications Rooms and Equipment Rooms, as well as outlet/device location height above finished floor – indicate figured dimension on Shop Drawings.

c. Refer to individual sections for additional Shop Drawing requirements.

52. Samples

a. Refer to individual sections for requirements.

53. Certificates

a. Refer to individual sections for requirements.

T. Refer to individual sections for additional Pre-Construction Submittal requirements.

U. Project Closeout

B. Include **bolded items** in Preliminary Project Closeout Submittal (a minimum of two weeks before Final Site Observation) to facilitate Final Site Observation by Design Consultant.

V. Bill-of-Materials / Product Index – Update Bill-of-Materials that was included in the Pre-Construction Submittal with actual equipment installed. Include columns populated with the following information:

1. Product Name (from Specifications)
2. Manufacturer
3. Model Number
4. Quantity installed on project
5. Manufacturer Warranty period (if longer than one year)

W. Product Data (Cutsheets)

6. Shall be in the same order as listed in the Specifications and Bill-of-Materials.

X. Operation and Maintenance Data

7. Shall be in the same order as listed in the Specifications and Bill-of-Materials.

Y. Warranty Documentation

8. Include PDF copy of any Warranty documentation and/or certifications that came with the installed products or required by these Specifications.
9. Shall be in the same order as listed in the Specifications and Bill-of-Materials.

Z. Test Results

10. Include PDF copy of Functional Test Reports for each section.
11. Refer to individual sections for testing requirements.

AA. Spare Parts and Tools

12. At time of Owner Training, furnish any and all spare parts and tools to the Owner that are required by the Contract Documents.
13. In the Project Closeout Submittal, include PDF copy of delivery receipt, indicating items and quantities that were furnished to the Owner, as well as the date, time, and Owner Representative that took possession of the items.
14. Refer to individual sections for additional requirements.

BB. Record Drawings (“As Builts”)

15. Maintain a copy of approved Submittals, Shop Drawings, and Change Orders on the Site (or the Project’s Construction Administration website), and update with changes during construction. Any minor changes to the Drawings shall be updated on a weekly basis. These drawings shall be made available for inspection at any point during construction when requested by the Architect / Design Consultant.
16. At the conclusion of the project, utilize AutoCAD or BIM software (such as Revit or Navisworks) to incorporate the changes to the Shop Drawings.
    a. PDF markups in software such as Bluebeam will not be acceptable.
17. As-Built drawings shall be produced in AutoCAD 2013 or higher and provided in hardcopy and electronically in .dwg and PDF format. Provide (1) laminated copy ARCH C (18” X 24”) in each MDF/IDF.
18. Include both PDF and AutoCAD (2013 dwg file type) versions of every drawing in the Project Closeout Submittal.

a. PDF needs to be an original, provided to the district not a photocopy converted.

19. Hardcopy drawings shall be provided in the original size as issued by the Architect/Design Consultant.
    a. Drawings need to have the final room numbers not construction room numbers.
    b. Drawings should have the network drop name at the user locations in the As-builds.
    c. PDF needs to be an original provided to the district not a photocopy converted.
20. Drawings shall be provided to the Architect/Design Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Architect/Design Consultant.
21. Refer to individual sections for additional requirements.

CC. Special Requirements – Refer to individual sections for additional requirements.

DD. Coordination

EE. Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to the Architect/Design Consultant any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from the Architect/Design Consultant before proceeding with any Work affected thereby.

FF. If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to the Architect/Design Consultant in writing. Contractor shall not proceed with the Work affected thereby until an amendment or supplement to the Contract Documents has been issued.

GG. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

HH. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

II. Refer to General Requirements / Division 1 for Schedule requirements. Subcontractors for Division 27 Work shall coordinate with Contractor in establishing schedules and timetables to perform the Work and perform that Work per those established schedules.

JJ. The Contractor/Subcontractor for each Division 27 Section shall maintain a Project Manager (per the Quality Assurance paragraph of that Section) that is on the jobsite whenever Work for that Section is being performed. This Project Manager shall coordinate the Work with other trades, such that Division 27 Work is installed per the Schedule, with the required clearances for all Divisions of Work, and meets the required codes and standards.

KK. Division 27 Work shall not impair, hinder, or delay Work of other trades.

LL. Before starting Work, examine adjacent Work performed by other divisions (trades) to determine if there are any conditions that would be detrimental or prevent Division 27 Work from being a successful installation. Notify issues to Contractor for remediation prior to starting Work.

MM. Unless otherwise indicated with a figured dimension, Drawings are schematic - indicating approximate location of devices and equipment. Communications devices and equipment may be figure-dimensioned on the Architectural Drawings, which take precedence over the approximate locations on the technology Drawings. Where neither Architectural or technology Drawings include a figured dimension, exact location shall be determined by scaled dimension and coordination with requirements of other trades. Errors that could have been avoided by proper coordination shall be corrected without additional costs to the Owner.

NN. Coordination with other Divisions

22. Division 21 Fire Suppression – ensure no piping is routed overhead through a Communications Room or Equipment Room, except where serving a fire suppression device in the Communications/Equipment Room.
23. Division 22 Plumbing – ensure no piping is routed overhead through a Communications Room or Equipment Room.
24. Division 23 Mechanical – ensure no piping or ductwork is routed overhead through a Communications Room or Equipment Room, except where serving Mechanical equipment in the Communications/Equipment Room.
25. Division 26 Electrical
    a. Ensure no conduits are routed overhead through a Communications Room or Equipment Room, except where serving an Electrical panelboard or receptacles in the Communications/Equipment Room.
    b. Coordinate exact location of receptacles / hard-wired circuits for Division 27 equipment with Division 26 Contractor prior to rough-in installation.
    c. Prior to connecting Division 27 devices and equipment to an electrical receptacle, utilize a ground circuit impedance tester to detect any wiring errors and low equipment ground impedances. If any issues are detected, notify Division 26 Contractor for correction prior connecting Division 27 devices and equipment.
26. Refer to individual sections for additional coordination requirements.

OO. Preinstallation Meetings

27. Refer to individual sections for additional requirements.

PP. Sequencing / Scheduling

28. Refer to individual sections for specific sequencing / scheduling requirements.

QQ. Structural Requirements

RR. For equipment in excess of 200 pounds that is attached to overhead structure, additional structural design analysis is required to confirm overhead structure can support the equipment weight and to determine supports and connection types. This design analysis is Delegated Design, to be completed by the Contractor's structural engineer. The cost of the Delegated Design and required supports and connection types for Communications Systems shall be included in the Contractor's Bid.

SS. Structural Analysis Requirements

29. Structural analysis shall be performed by a structural engineer licensed in the state of the Project. Delegated Design submittals and Shop Drawings shall be stamped by this structural engineer.

TT. Patent Fees, Royalties, Permits, and Taxes

UU. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others.

VV. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

WW. Unless otherwise provided in the Supplementary Conditions, Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

XX. Delegation of Professional Design Services

YY. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

ZZ. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Design Consultant will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Design Consultant.

AAA. Owner and Design Consultant shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Design Consultant have specified to Contractor all performance and design criteria that such services must satisfy.

BBB. Pursuant to this Paragraph, Design Consultant's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents.

Products

CCC. General Product Requirements

DDD. Materials and equipment incorporated into the Work shall be as specified and of good quality and new, except as otherwise noted in the Contractor Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by these specifications or when requested by the Owner or Design Consultant, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

EEE. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.

FFF. Performance Criteria

30. Regulatory Requirements

    a. Utilize products listed by a National Recognized Testing Laboratory (such as UL), except where no relevant standard exists. These products shall bear a permanent mark/label of the NRTL.

    b. All equipment and material used in the installation shall be listed for the environment in which it is being installed. Examples – plenum-rated where installed in a return air plenum; wet or outdoor listed where installed in Wet or Damp Locations.

    c. Refer to individual sections and products for specific NRTL requirements.

31. Sustainability Characteristics

    a. Refer to General Requirements / Division 1 for general Project and Product Sustainability requirements.

    b. Refer to individual Division 27 sections and products for specific Sustainability requirements.

GGG. Lead Time Issues

32. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Architect/Design Consultant prior to submitting a Bid for this work. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues and the Contractor will have all products on-site when needed to complete the Work as required.

HHH. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall substitute the appropriate equivalent manufacturer's part number.

III. In the event of a discrepancy between these Specifications and the Drawings, the greater quantity and/or better quality shall be assumed for Bidding purposes.

JJJ. Substitutes and "or equals"

KKK. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to the Architect/Design Consultant for review under the circumstances described below.

33. "Or-Equal" Items: If in the Design Consultant's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Design Consultant as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

    a. In the exercise of reasonable judgment, the Design Consultant determines that:

        1) It is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics.
        2) It will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
        3) It has a proven record of performance and availability of responsive service.

    b. Contractor certifies that, if approved and incorporated into the Work

        1) There will be no increase in cost to the Owner or increase in Contract Times: and
        2) It will confirm substantially to the detailed requirements of the item named in the Contract Documents.

34. Substitute Items:

    a. If in the Design Consultant's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under the Paragraph above, it will be considered a proposed substitute item.

    b. Contractor shall submit sufficient information as provided below to allow Design Consultant to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by the Design Consultant from anyone other than Contractor.

    c. Contractor shall make written application to the Architect/Design Consultant for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

        1) shall certify that the proposed substitute item will:

            a) perform adequately the functions and achieve the results called for by the general design,

            b) be similar in substance to that specified, and

            c) be suited to the same use as that specified.

        2) will state:

            a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,

b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

3) will identify:

a) all variations of the proposed substitute item from that specified, and

b) available engineering, sales, maintenance, repair, and replacement services; and

4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

d. Cost Reimbursement: in certain situations, evaluating a proposed substitution will require additional time by the Design Consultant. These situations will either be described in subsequent Specification sections or conveyed in writing to the Contractor prior to evaluation by the Design Consultant. Design Consultant will record Design Consultant's costs in evaluating the proposed substitution. Whether or not Design Consultant approves the proposed substitution, Contractor shall reimburse Owner for the reasonable charges of Design Consultant for evaluating each proposed substitute. Contractor shall also reimburse Owner for the reasonable costs for Design Consultant, Architect, and Engineer(s) in making changes in the Contract Documents resulting from the acceptance of each proposed substitute.

LLL. Proposed equivalent items shall be approved by Design Consultant prior to purchase or installation. Proposed equivalent items shall meet or exceed these specifications and the specifications of the specified item.

Execution

MMM. General Installation Requirements

NNN. Verification of Conditions

35. Prior to submitting a Bid, visit the project Site and existing facility (facilities) and become familiar with the conditions affecting the proposed scope of Work. Make provisions as to the cost associated with the existing conditions and include those costs in the Bid.

36. Existing Interior Conditions

a. Refer to Existing Conditions paragraph in Part 1 of this Section.

37. Underground Facilities

a. Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Communications Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Design Consultant by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1) Owner and Design Consultant shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2) the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a) reviewing and checking all such information and data.

b) locating all Underground Facilities shown or indicated in the Contract Documents.

c) coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and

d) the safety and protection of all such Underground Facilities and repairing any damage

e) thereto resulting from the Work.

b. Not Shown or Indicated:

1) If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Architect/Design Consultant. Architect/Design Consultant will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

OOO. Preinstallation Testing

38. Refer to individual sections for requirements.

PPP. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

QQQ. No deviations from the Contract Documents shall be made without full consent in writing of the Architect/Design Consultant. The Contractor shall have written approval from the Architect/Design Consultant for any additional work beyond the Contract Documents prior to beginning such work. If the Contractor does not obtain written approval from the Architect/Design Contractor prior to proceeding with the work, the contractor shall not be reimbursed for the work.

RRR. Cleaning

39. During the progress of the Work, Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations. Contractor shall dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner’s facilities for the disposal of excess or scrap materials.

40. Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

SSS. Protection

41. The Contractor shall protect Communications Work from damage by other trades and theft.

a. Any Division 27 cabling that has more than 3-inches of paint on the jacket shall be replaced without additional cost to the Owner.

42. Where owner-furnished or provided equipment is installed prior to Substantial Completion, access to that room or area shall be restricted/locked whenever unoccupied.

TTT. Power

43. Prior to connecting any Communications equipment to a power receptacle, use a ground circuit impedance tester to confirm AC wiring and grounding has been installed correctly; confirm voltage and neutral-to-ground wiring are correct prior to energizing equipment. If not correct, notify Division 26 Contractor of the issue.

UUU. Temporary Power, HVAC, and Communications Systems

44. Where owner-furnished or provided network equipment is required to be installed prior to Substantial Completion in order for Communications Systems Work to be functional, the room or area where that network equipment is installed shall be equipped with permanent or temporary power and heating/cooling at no additional costs to the Owner. Acceptable temperature range is 60 to 89 degrees Fahrenheit.

45. When, through no fault of the Owner or Architect/Design Consultant, Communications Systems Work is not completed by Substantial Completion, temporary Communications Systems may be required while the Site is partially occupied by the Owner and shall remain installed until acceptance of permanent system(s); refer to individual sections for requirements.

VVV. Integration Requirements

WWW. Refer to individual sections for integration requirements.

XXX. Repair / Restoration

YYY. Contractor shall be responsible for the repair of any damage caused by the Contractor or Subcontractors during the installation.

ZZZ. Selective demolition may be necessary to facilitate installation of Communications Systems equipment and pathways. The Contractor shall obtain written permission from the Architect/Design Consultant before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to girders, beams, floors, walls, roofs, or ceilings. After installation, Contractor shall restore floors, walls, roofs, and ceilings to their original condition.

46. Avoid penetrations or installation of equipment onto or through waterproof assemblies such as roofs, exterior walls, and slab-on-grade floors. If installation cannot be avoided, install before waterproofing; protect installation area from weather/elements until sealing and waterproofing is complete.

AAAA. Functional and Performance Testing

BBBB. After components have been installed, perform functional tests to ensure system components are installed and configured correctly in conformance with manufacturer's instruction and the Contract Documents. Correct any issues and retest. Include Test Report documentation in Preliminary and Final Project Closeout Submittals.

CCCC. Third-party testing or manufacturer onsite services may be necessary for certain Division 27 systems or sub-systems; refer to individual sections for exact requirements.

DDDD. Refer to individual sections for additional testing requirements.

EEEE. Field Observations

FFFF. A minimum of two weeks in advance, notify Design Consultant and Owner as to the readiness for a Field Observation for the following:

47. Rough-In Observation – after conduits have been installed, but before walls have been installed.

48. Above Ceiling Observation – after cabling has been installed, but before ceilings have been installed.

49. Final Site Observation – a minimum of two weeks before Substantial Completion, to occur after Preliminary Project Closeout Submittal has been submitted.

GGGG. Non-Conforming Work

50. After receipt of written notice of defective Work, Contractor shall correct all defective Work, or, if the Work has been rejected by the Architect/Design Consultant, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages arising out of or relating to such correction or removal.

HHHH. Demonstration, Training, and Adjustments

IIII. Conduct training sessions to Owner's personnel to demonstrate system operation and preventative maintenance procedures.

51. Refer to individual sections for additional training requirements.

JJJJ. After Owner has taken occupancy, Communications Systems equipment and components may require minor adjustments to be performed by the Contractor/Subcontractor to align with Owner's actual use of the systems. Refer to individual sections for specific adjustment requirements.

KKKK. Software, Network, and Cybersecurity Requirements

LLLL. Software Requirements

52. All firmware found in products furnished or provided by the Contractor shall be the latest and most up-to-date provided by the manufacturer.

53. All equipment requiring users to log on using a password shall be configured with user/site-specific password(s). No system/product default passwords shall be allowed. Coordinate user logins and passwords with Owner prior to system setup.

54. Refer to individual sections for additional software requirements.

MMMM. Network and Cybersecurity Requirements

55. For all Communications Systems that have Contractor-provided equipment with an Ethernet/LAN port, Contractor shall coordinate with Owner's IT staff regarding Owner's network and cyber security requirements.

56. Within two weeks after Notice to Proceed, the Contractor (and/or Subcontractors for each Communications System) shall request an IT Coordination Kickoff Meeting with Owner's IT staff to ascertain and document Owner's requirements. Contractor shall document this meeting and send meeting minutes to all parties in attendance as well as Architect/Design Consultant.

57. At a minimum, coordinate the following network requirements for Contractor-provided equipment with the Owner's IT staff:

    a. IP address quantities and assignments for each equipment type and location, including subnets and subnet masks.

    b. PoE quantities and power requirements (PoE, PoE+, high powered PoE, etc) for each equipment type and location.

    c. Bandwidth requirements, including any prioritization or unicast/multicast requirements.

    d. VLAN use and assignment

    e. Encryption requirements

    f. WAN connection requirements

    g. Firewalls

    h. Planned approach for software upgrades and security patching.

    i. Follow additional network requirements and procedures as directed by the Owner's IT staff.

58. The Contractor shall take positive measures to prevent the introduction of cybersecurity threats to the Owner's technology infrastructure and network. These measures shall include but are not limited to:

a. The Contractor shall scan contractor-provided or furnished equipment for cyber threats such as viruses, malware, ransomware, etc., prior to connecting the equipment to the Owner's network.

b. Coordinate with the manufacturer to ensure newly procured equipment does not have any cybersecurity notices, bulletins, or alerts. Provide a letter to the Design Consultant with the submittal documents for that Specification section confirming there are no active or known cyber threats.

c. Ensure all installers/technicians installing or configuring equipment are trained on the prevention of introduction of cyber threats to electronics.

d. The Contractor shall assess whether or not there are any cyber threats / vulnerabilities associated with the specified equipment, prior to procurement/installation. If cyberthreats are discovered, notify the Design Consultant within one Day. Provide the make and model of the associated equipment and the vulnerability.

e. Follow additional cybersecurity requirements and procedures as directed by the Owner's IT staff.

59. Refer to individual sections for additional Networking and Cybersecurity Requirements.

NNNN. Maintenance

OOOO. Warranty Service

60. Pursuant to Contractor's General Warranty and Guarantee, Owner may request Warranty Service for a period of 1 year after Substantial Completion for Communications Systems components due to faulty material or installation.

61. Upon written notice from Owner, promptly perform remedial / corrective Work to bring the associated system(s) to compliance with the Contract Documents and satisfaction of the Owner.

    a. In this context, "promptly" means within 7 Days, unless a quicker response and remediation time is specified in the associated Division 27 specification section.

62. Refer to individual sections for additional Warranty Service requirements.

PPPP. One Year Warranty Check

63. 50 weeks after Substantial Completion, Contractor or Subcontractor for each Division 27 section shall conduct a site visit with Owner's facility personnel to ensure systems and components are still operating as intended / required by the Contract Documents. Promptly perform corrective Work while on site or within 7 Days.

    a. Pursuant to Contractor's General Warranty and Guarantee, corrective Work is not required if system / component is deficient due to:

        1) abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
        2) normal wear and tear under normal usage.

QQQQ. Drawings and Specifications after Substantial Completion

RRRR. Contractor and any Subcontractor or Supplier shall not:

64. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by Combs Consulting Group, LP, including electronic media editions; or

65. reuse any such Drawings, Specifications, other documents, or copies thereof on any other project without written consent of COMBS Consulting Group, LP.

SSSS. The prohibitions in the paragraph above survive final payment, or termination of Contract. Nothing herein shall preclude Contractor or Owner from retaining copies of the Contract Documents for record purposes.

TTTT. Physical paper copies of Drawings and Specifications shall be properly destroyed (shredded) when no longer needed to perform the Work.

END OF SECTION

SECTION 27 05 33 - PATHWAYS FOR COMMUNICATIONS SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section and the associated Technology (T Series) Audiovisual (TA Series), PA (TPA Series) and Security (TS Series) Drawings and Contract Documents identify the requirements, technical design, and specifications for pathways for Communications Systems for the Project. The conduit and backboxes shall be in compliance with the latest version of TIA-569 and the locally adopted version of the NFPA 70 (National Electric Code) and shall include all components needed to ensure proper system performance and code compliance as specified.

B. Functionally complete pathways shall be provided in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result shall be provided whether or not specifically called for, at no additional cost to Owner.

C. The pathways for Communications Systems includes the following main components:

1. Conduit / Sleeves and accessories
2. Backboxes
3. Floorboxes / Poke Thru Devices
4. Pullboxes (Junction Boxes)
5. Wire-mesh Cable Tray
6. Surface Raceways and Boxes
7. Firestopping Systems
8. Labeling

1.2 RELATED SECTIONS

A. Work required by this Section shall meet the requirements of Section 27 00 10 General Requirements for Communications.

B. Refer to Division 26 for Electrical System requirements, including but not limited to additional material and installation requirements for Communications Systems conduit, backboxes, floorboxes, and pullboxes.

C. Refer to Section 27 00 10 for associated General Requirements for Communications

D. Refer to Section 27 10 00 for associated Structured Cabling requirements

E. Refer to Section 28 13 00 for associated Access Control System

F. Refer to Section 28 23 00 for associated Video Surveillance System

1.3 CONFIDENTIALITY

A. Refer to Section 27 00 10 for confidentiality requirements.

1.4 ABBREVIATIONS

A. NECA – National Electrical Contractors Association

B. NEMA – National Electrical Manufacturers Association

C. Refer to Section 27 00 10 for additional abbreviations.

1.5 DEFINITIONS

A. Transition Point Enclosure

B. Refer to Section 27 00 10 for additional definitions.

1.6 REFERENCE STANDARDS

A. Codes and Regulations

1. Refer to Section 27 00 10 for additional Codes and Regulations.

B. Standards

1. NECA 1 – Standard for Good Workmanship in Electrical Construction
2. NECA/BICSI 568 - Installing Commercial Building Telecommunications Cabling
3. NECA/BICSI 607 – Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
4. TIA 569 – Telecommunications Pathways and Spaces
5. TIA 606 – Administration Standard for Telecommunications Infrastructure
6. TIA 607 – Generic Telecommunications Bonding and Grounding for Customer Premises
7. Refer to Section 27 00 10 for additional Standards.

C. Guidelines

1. BICSI – Telecommunications Distribution Methods Manual
2. NEMA VE 2 - Metal Cable Tray Installation Guidelines
3. Refer to Section 27 00 10 for additional Guidelines.

1.7 QUALITY ASSURANCE

A. Contractor Qualifications

1. The Contractor shall be a Panduit Gold Certified.
2. The Contractor shall have been in business for a minimum of five (5) years.
3. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a 75-mile radius of the project Site.
4. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.
5. The Contractor shall have a minimum of (2) certified BICSI and Panduit certified installers, full-time employees of the company and on onsite at all times.
6. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.
7. Firestopping Contractor Qualifications
    a. Firestopping materials shall be part of a UL listed System and installed by a certified technician.
    b. Contractor / Subcontractor installing Firestopping shall be qualified and properly trained, with at least one of the following certifications:
        1) FCIA (Firestop Contractors International Association) – FM 4991 Approval
        2) UL Qualified Firestop Contractor
        3) Installation Certification through firestopping manufacturer.
            a) Specified Technologies, Inc products – all installers shall be FIT Level 1 Certified through STI.
            b) Hilti products – Contractor / Subcontractor shall be part of Hilti Firestop Specialty Contractor Program
            c) Or Approved Equivalent
    c. Submit proof of certification as part of Pre-Construction Submittal.
8. Refer to Section 27 00 10 for additional Contractor Qualifications requirements.

B. Personnel Qualifications

1. At all times during the progress of the Work, Contractor (or Subcontractor) responsible for the Work of this Section shall assign a competent Project Manager with the following qualifications / credentials:

a. A minimum of five years of experience overseeing installation of Communications Pathways and who is familiar with the requirements of TIA and BICSI Reference Standards listed above.

2. Include resume(s) of the above personnel per Submittal requirements and when requested by Owner or Design Consultant.

C. Site Observations

1. Contractor's RCDD (per Section 27 10 00 Structured Cabling) shall make weekly inspections during construction to ensure Pathways for Structured Cabling are installed properly and per the Contract Documents.
2. Contractor's CTS-I/CTS-D (per Section 274 1 00 Audio Visual Systems) shall make weekly inspections during construction to ensure Pathways for Audio Visual Systems are installed properly and per the Contract Documents.

1.8 WARRANTY

A. Refer to 27 00 10 for General Warranty requirements.

B. Manufacturer Warranty

1. Panduit Manufacturer's 25-Year Performance Certification for the installed structured cabling system.

C. Contactor's Statement of Warranty

1. Statement of warranty shall be provided to the Architect/Design Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Architect/Design Consultant.

a. Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor, and workmanship starting at final system acceptance.
b. One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e., Contractor name, Point of Contact, address, phone number, and email address) and start and end date for warranty call outs.

D. Special Warranty

1. No special warranty is required for Pathways for Communications Systems.

1.9 SUBMITTALS

A. Refer to Section 27 00 10 for General Submittal Requirements.

B. Pre-Bid

1. Submit clarifying questions and product Substitution Requests prior to the questions deadline prior to Bid.
2. Submit Contractor and Personnel Qualifications documentation indicating that the requirements of the Quality Assurance paragraph of this Section and Section 27 00 10 are met.

C. Bid

1. Refer to Section 27 00 10 for general Bid requirements.

D. Pre-Construction

1. Refer to Section 27 00 10 for general Pre-Construction Submittal requirements and procedures.
2. Pre-Construction Submittal for this Section shall include the following:

a. Bill-of-Materials
b. Product Data
c. Firestopping UL System information
d. Shop Drawings

1) Refer to Section 27 00 10 for general Shop Drawing Requirements
2) Shop Drawings for Work of this Section shall also include:

a) Floor plans showing the following work:

i) Cable tray routing, size and height AFF. Cloud minor changes from Drawings and indicate reason for minor deviation – ie "Routed on west side of corridor due to conflict with mechanical duct." Submit RFI for major changes in routing – ie when coordination issues require cable tray to be routed in different room.

ii) Dimensioned multi-service floor box and poke thru device locations. For slab-on-grade floor boxes, also indicate quantity, size and routing of conduit under/in slab to serving Communications Room (for Structured Cabling) and to rack or accessible ceiling space (for Audio Visual).

b) Pathways for Structured Cabling (including firestopping requirements identified by UL System number) shall be identified on Section 27 10 00 Shop Drawings.

c) Pathways for Audio-Visual Systems (including firestopping requirements identified by UL System number) shall be identified on Section 27 41 00 Shop Drawings.

d) Pathways for Paging Systems (including firestopping requirements identified by UL System number) shall be identified on Section 27 51 00 Shop Drawings.

1.10 PROJECT CLOSEOUT

A. Refer to Section 27 00 10 for general Project Closeout submittal requirements.

B. Project Closeout submittal for this Section shall include the following:

1. Bill-of-Materials / Product Index
2. Product Data
3. Operation and Maintenance Data
4. Warranty Documentation
5. Test Results
6. Training and Spare Parts

a. Signed acceptance letter or form indicated Owner has been properly trained in operation of the system and has taken possession of the specified Spare Parts and Tools (items listed as "Furnish to Owner").

7. Record Drawings ("As Builts")

a. Maintain a copy of approved Shop Drawings on the Site (or the Project's Construction Administration website), and update changes to pathways made during construction.
b. At the conclusion of the project, utilize AutoCAD or BIM software (such as Revit or Navisworks) to incorporate the pathway changes to the Shop Drawings.
c. PDF markups in software such as Bluebeam will not be acceptable.
d. As-Built drawings shall be produced in AutoCAD 2013 or higher and provided in hardcopy and electronically in .dwg and PDF format. Provide (1) laminated copy ARCH C (18" X 24") in each MDF/IDF.
e. Drawings need to have the final room numbers not construction room numbers.
f. Drawings should have the network drop name at the user locations in the As-builds.
g. PDF needs to be an original provided to the district not a photocopy converted.
h. Include both PDF and AutoCAD (2010 dwg file type) versions of every drawing in the Project Closeout Submittal.

1.11 COORDINATION

A. Refer to Section 27 00 10 for general Coordination requirements.

B. Coordination with other Divisions and Sections

1. Coordinate routing of cable tray with other trades prior to construction. Installation of cable tray without required clearances will not be accepted. Include in Bid cost of minor cable tray routing adjustments (within the same corridor) due to conflicts with other trades.

C. Preinstallation Meeting

1. After Bid and before Preconstruction Submittals, request a Preinstallation Meeting with General Contractor and other Division 27 and 28 Subcontractors regarding Work specified in this Section.

1.12 STRUCTURAL AND SEISMIC REQUIREMENTS

A. Refer to Section 27 00 10 for structural and seismic requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Refer to Section 27 00 10 for general product requirements.

2.2 CONDUIT / SLEEVES AND ACCESSORIES

A. Electric Metallic Tubing (EMT) and fittings

1. Refer to Division 26 for specific product and material requirements.
2. Shall meet ANSI C80.3, UL 797
3. Manufacturers:

a. Allied Tube or equivalent

B. Intermediate Metal Conduit (IMC) and fittings

1. Refer to Division 26 for specific product and material requirements.
2. Shall meet ANSI C80.6, UL 1242
3. Manufacturers:

a. Allied Tube or equivalent

C. Rigid Metallic Conduit (RMC) and fittings

1. Refer to Division 26 for specific product and material requirements.
2. Shall meet ANSI C80.1, UL 6
3. Manufacturers:

a. Allied Tube or equivalent

D. Conduit Support / Fittings / Accessories

1. Conduit Clamps

a. Caddy Screw On Conduit Clips – For 1-inch – Part No. CS16
b. Or equal

2. 1-5/8” Framing System

a. Unistrut Support Channel – Part No. P1000 T
b. Or equal

3. Conduit Bushings

a. Nylon Bushings Sized for the Conduit Installed

4. Innerduct

a. Install size and type as identified on Drawings.
b. 1” or 1-1/4” diameter
c. Composed of HDPE (High Density Polyethylene)
d. UL listed for Riser Plenum installation
e. Footage markings every two feet
f. With pull tape preinstalled
g. Manufacturer:

1) Innerduct
2) Carlon
3) Panduit

5. Fabric Innerduct - must use a swivel head(s) for installation.

a. Textile innerduct
b. Type (cell size and quantity) as identified on Drawings.
c. UL listed for Riser installation
d. With pull tape preinstalled in each cell
e. Manufacturer:

1) MaxCell – Riser
2) No Substitutions

2.3 BACKBOXES

A. Size, Gang, and Trim Ring per Drawings

B. Boxes installed into stud walls:

1. Single gang:

a. 2” by 3” by 2-1/2” deep
b. Reference Div 26 for acceptable manufacturer

2. Double gang:

a. 4-11/16” by 4-11/16” by 2-1/8” deep
b. With a minimum of 3/8” deep trim ring; depth to match thickness of gypboard wall material.
c. Reference Div 26 for acceptable manufacturer

3. TV Display backbox:

a. Specialty in-wall backbox Reference specification section 27 41 00

4. TV Display backbox – shallow depth

a. Specialty in-wall backbox Reference specification section 27 41 00

5. TV Display backbox – fire-rated wall

a. Specialty in-wall backbox
b. Minimum opening dimension: 10” by 8”
c. With (4) pre-wired electrical outlets (120V AC)
d. With (2) 1-1/2” knockouts in top and bottom for AV conduits
e. With [white] [black] cover with slot openings for cables and ventilation
f. [With bracket to install Crestron RMC device]
g. Manufacturer:

1) FSR PWB-FR-450
2) Or Approved Equal

C. Boxes installed into CMU (concrete masonry unit) walls:

1. Single gang:

a. 2” by 3” by 3-1/2” deep
b. Reference Div 26 for acceptable manufacturer

2. Double gang:

a. 2” by 3” by 3-1/2” deep
b. Reference Div 26 for acceptable manufacturer

D. Boxes installed in exterior / Wet locations:

1. Shall be die-cast aluminum - with watertight covers to fit installed size.
    a. Reference Div 26 for acceptable manufacturer

E. Specialty AV Backboxes

1. Size per Drawings
2. Boxes identified by Manufacturer and Model number represent the Basis-of-Design. Alternate manufacturers will be considered; submit Substitution Request in compliance with Division 1.

2.4 FLOORBOXES / POKE THRU DEVICES

A. Multi-service Floor box – Power and Data only

1. Shall have a minimum of 4-gangs, with separate compartments for power and data.
2. Shall accept (1) (2) 1-inch 1-1/4-inch conduit(s) reserved for data cabling.
3. Stamped steel box, concrete-tight construction.
4. Shall maintain fire-rating of floor.
5. Provide power insert for every duplex indicated on Electrical Drawings.
6. Provide decora-style opening insert for every four data jacks on Technology Drawings.
7. Provide blank inserts for any unused gangs.
8. Coordinate cover plate style and type with Architect.
9. Reference Div 26 for acceptable manufacturer

B. Multi-service Floor box – Power and Data only – Slab-on-Grade locations

1. Shall have a minimum of 4-gangs, with separate compartments for power and data.
2. Shall accept (1) (2) 1-inch 1-1/4-inch conduit(s) reserved for data cabling.
3. Cast iron box, watertight, Class 1 construction.
4. Provide power insert for every duplex indicated on Electrical Drawings.
5. Provide decora-style opening insert for every four data jacks on Technology Drawings.
6. Provide blank inserts for any unused gangs.
7. Coordinate cover plate style and type with Architect.
8. Reference Div 26 for acceptable manufacturer

C. Multi-service Floor box – Shared Power, Data and Audio-Visual

1. Refer to Section 27 41 00 for AV Floor box requirements.

D. Multi-service Poke Thru Device – Power and Data only

1. 6-inch diameter flush-mounted poke thru
2. 2-inch conduit opening for
3. UL listed and UL fire classified to match rating of floor
4. Provide power insert for every duplex indicated on Electrical Drawings.
5. Provide decora-style opening insert for every four data jacks on Technology Drawings.
6. Provide blank inserts for any unused gangs.
7. Coordinate cover plate style and type with Architect.
8. Reference Div 26 for acceptable manufacturer

E. Multi-service Poke Thru Device – Shared Power, Data and Audio-Visual

1. Refer to Section 27 41 00 for AV Poke Thru Device requirements.

2.5 PULLBOXES (JUNCTION BOXES) - NOT TO BE USED FOR CABLE PATH TURNS.

A. Sized per Part 3 of this Section

B. Metallic or steel construction

C. Removable cover. Boxes with a dimension greater than 24-inches shall have a hinged cover.

D. Interior locations: NEMA Type 1

E. Damp or Wet Locations (as defined by the NEC): NEMA Type 4

F. Manufacturer:

1. NEMA Enclosures
2. Hoffman
3. Custom NEMA enclosures from sheet metal shop / fabricator
4. Or equivalent

2.6 SURFACE RACEWAYS AND BOXES - NOT TO BE USED FOR CABLE PATH TURNS.

A. Metallic Surface Raceways

1. Minimum cross-sectional area of low-voltage compartment shall be 1-square inch.
2. Manufacturer shall be:

a. Hubbell
b. Wiremold
c. Panduit
d. Monosystems

B. Metallic Surface Box

1. Single-gang or double-gang per Drawings
2. Minimum interior depth shall be 2-1/2-inches.
3. Manufacturer shall be:

a. Same as Metallic Surface Raceway

C. Non-metallic Surface Raceways

1. Minimum cross-sectional area of low-voltage compartment shall be 1-square inch.
2. Manufacturer shall be:

a. Hubbell
b. Wiremold
c. Panduit
d. Monosystems

D. Non-Metallic Surface Box

1. Single-gang or double-gang per Drawings
2. Minimum interior depth shall be 2-1/2-inches.
3. Manufacturer shall be:

a. Same as Non-Metallic Surface Raceway

2.7 WIRE-MESH CABLE TRAY AND ACCESSORIES

A. Flexible, wire-mesh cable tray, with wire-mesh openings of approximately 2-inches by 4-inches, welded at all intersections.

B. UL listed as an equipment grounding conductor.

C. Contractor shall use associated hardware to provide solid support and grounding (sized appropriately according to manufacture specifications) to be used outside the MDF/IDF and a minimum of 20’ in any direction cabling trunks leave MDF/IDF.

D. Size per Drawings.

E. Utilize manufacturer-specific accessories as needed, including but not limited to:

1. Splice kits
2. Trapeze Support Brackets (center support brackets are not allowed)
3. 3/8-inch (or larger) threaded rod
4. Wall / Triangular Support Brackets
5. Split Bolt Grounding Clamp

F. Manufacturer:

1. Panduit
2. Or Approved Equivalent

2.8 FIRESTOPPING SYSTEMS

A. Fire-Rated Pathway Device (Sleeve)

1. Steel pathway (sleeve) with integral intumescent firestopping material to facilitate the initial installation - and frequent moves, adds, and changes - of low-voltage voice/data, fiber, video, security, paging, etc cabling.
2. UL System meeting the hourly fire-rating of the wall or floor type
3. Multiple pathways in the same location shall be ganged together.
4. Plenum-rated
5. Manufacturer:

    a. Specified Technologies Inc – EZ Path Fire-Rated Pathway

        1) 2” – Series 22
        2) 3” – Series 33
        3) 4” – Series 44

B. Firestopping for conduit penetrations

1. For metallic conduit or tube to be installed through 1 or 2 hr fire-rated wall or floor.
2. Manufacturer:

    a. Gypsum board stud walls

        1) Specified Technologies - UL System No. W-L-1222 with SpecSeal LCI Sealant
        2) Or equivalent from Hilti

    b. Concrete floors or walls

        1) Specified Technologies – UL System No. C-AJ-1353 with SpecSeal LCI Sealant
        2) Or equivalent from Hilti

C. Firestopping for backboxes in fire- or smoke-rated wall

1. For Communications backboxes to be installed in 1 or 2 hr fire-rated or smoke-rated walls.
2. STC sound rating – 64 or higher (related to specific construction)
3. Shall meet criteria of UL263 and classified for up to hrs as a Wall Opening Protective Material (Category CLIV)
4. Manufacturer:

    a. Specified Technologies – SpecSeal Power Shield
    b. Or equivalent from Hilti

D. Smoke-Rated or Acoustical Sleeves

1. Metallic or non-metallic pathway (sleeve) with integral self-adjusting smoke and sound sealing system to facilitate the initial installation – and frequent moves, ads, and changes – of low-voltage voice/data, fiber, video, security, paging, etch cabling.
2. L Rating – Air Leakage Test Procedure tested per UL1479 without a Fire Test
3. Less than 1.25 cubic feet per minute for 0% fill (cable) capacity
4. Less than 2.5 cubic feet per minute for 1 to 100% fill (cable) capacity
5. Sound Transmission Classification (STC) – 59 or higher (related to specific construction)
6. Plenum-rated
7. Manufacturer:

    a. Specified Technologies Inc – NEZ Pathway
    b. Hilti – Smoke and Acoustic Sleeve

E. Fire-rated Conduit (Circuit Integrity) Wrap

1. Endothermic wrap for EMT and RMC for protection of cable pathways for critical life safety circuits.
2. Tested to ASTM E1725 for circuit integrity
3. Manufacturer:
    a. Specified Technologies – E-Wrap Endothermic Wrap

2.9 LABELS

A. Machine-printed, thermal-transfer type with self-adhesive

B. Text size for pathways shall be 3/8” tall.

C. Manufacturer:

1. Brady
2. Dymo
3. Hellermann Tyton
4. Panduit
5. Or equivalent

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. General pathway requirements have been identified in the Contract Documents through the use of general notes, key notes, symbols, details, and Division 27 specifications. Contractor is responsible for coordinating and providing required pathways to support all Division 27 Work in compliance with the Contract Documents. Coordinate exact pathway requirements with Subcontractors of all Division 27 Sections prior to Bid and include associated pathways in Bid.

B. Refer to Section 27 00 10 for additional installation requirements.

3.2 CONDUIT / SLEEVES

A. The minimum size conduit shall be 1-inch.

B. EMT Conduit shall be used for all interior installations, unless otherwise noted.

1. Where service provider entrance conduits do not enter the building in the same room the service provider cables will be terminated, entrance conduit routed within the building shall be IMC.

C. PVC conduit shall only be installed in concrete or underground exterior of the building. Underground conduit bends and sweeps shall be IMC or RMC.

D. For exposed conduit routing in Damp or Wet Locations (as defined by the NEC) or parking garages, conduit type shall be IMC or RMC with water-tight fittings and backboxes.

E. Conduit shall be sized as indicated on the Technology drawings. If no conduit size is indicated, then conduits shall be a minimum of 1-inch in diameter and sized per TIA-569 – with maximum fill ratio of 40 percent.

F. Conduits shall not have more than the equivalent of (2) 90 degree bends or 180 degrees without the installation of a pullbox or hand hole.

G. For Interior Installations – conduits shall have a pull-box installed when the conduit exceeds 100 feet.

H. For Exterior Underground Installations – conduits shall have a hand hole or maintenance hole installed when the conduit exceeds 500 feet.

I. All conduits and sleeves shall be reamed after cutting to ensure there are no sharp edges or burrs on the conduit that could damage the cable.

J. All conduits and sleeves shall have a nylon bushing installed on the open end(s) of the conduit.

K. Conduits and sleeves shall not be shared with any other discipline unless specifically approved in writing by the Architect/Design Consultant.

L. Contractor is responsible for field coordination to ensure conduits and sleeves are separated from electrical conduits, and steam or hot water pipes: maintain a minimum clearance of 12-inches where routed parallel.

M. Unless indicated otherwise, all conduits shall be concealed under or within floor slabs, within finished walls, or above ceilings.

N. All conduits shall be installed parallel with or at right angles to ceilings, walls, and structural members.

O. Conduits shall be routed concealed in walls, above suspended ceilings, in concrete slabs, or below grade. Exposed conduit is allowed only in exposed-to-structure areas without suspended ceilings and where specifically noted by the Contract Documents.

P. Restrictions Applicable to EMT

1. Do not install underground.
2. Do not encase in concrete, mortar, grout, or other cementitious materials.
3. Do not use in areas subject to severe physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT.
4. Do not use outdoors.

Q. Install and bond in accordance with NFPA 70 and TIA-569. In addition, bond telecommunications conduit in accordance with TIA-607.

1. Conduits that stub into Communications Rooms shall be bonded to Telecom Ground Bar in Communications Rooms. Utilize #6 AWG conductor for lengths up 13 feet, a #4 AWG conductor for lengths of 14 to 20 feet, and a #3 AWG conductor for lengths of 21 to 26 feet with listed two-hole compression or exothermic lugs at Ground Bar. Provide pipe grounding connector at conduit. Refer to TIA 607 standard for conductor size requirements for lengths longer than 26 feet.

R. Conduit Through Floor Slabs - Where conduits rise through floor slabs, curved portion of bends shall not be visible above finished slab.

S. Directional Changes in Conduit Runs

1. Make changes in direction of runs with symmetrical bends
2. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits.
3. Prevent plaster, dirt, or trash from lodging in conduits, boxes and fittings during construction. Free clogged conduits of obstructions.

T. Sleeves through floors shall be rigidly supported utilizing a cast-in-place as the preferred method or using a unistrut rack system and shall extend through either side of the ceiling/floor a minimum of 4-inches.

U. Sleeves through walls shall be rigidly fastened to the studs and extend a minimum of 4-inches on either side.

V. Install each conduit longer than 5 feet with a nylon pull string with a minimum tensile strength of 200 lbs.

W. Conduit and Sleeve Supports

1. Support conduit and sleeves in underground installations using 2-inch duct spacers.
2. Support conduit and sleeves in interior installations using pipe straps, wall brackets, hangers, or ceiling trapeze.
3. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work.
4. Do not support conduit by ceiling support system. Conduit and box systems shall be supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed.
5. Supporting means shall not be shared between telecommunication raceways and electrical raceway, mechanical piping or ducts.
6. Installation shall be coordinated with above-ceiling electrical and mechanical systems to assure maximum accessibility to all systems.
7. Conduit and sleeves shall be supported by a trapeze or wall support brackets.
8. A minimum of 3/8-inch all-thread shall be used for trapeze supports.
9. Support in accordance with NFPA 70 at intervals not to exceed three feet from the box and every 10 feet afterwards.

10. Conduit and sleeves shall be no less than 3-inches above a lay-in ceiling.
11. Conduit and sleeves shall be rigidly supported and level.
12. All supports shall attach to structure or a rigid surface.
13. Supports shall not be shared with any other discipline unless specifically approved by the Architect/Design Consultant.

X. Fabric Innerduct - must use a swivel head(s) for installation.

1. If Contractor has not previously installed fabric innerduct, contact Cody Albin prior to installation for free installation support offered by the manufacturer: cody.albin@milliken.com, 512-388-7198.

3.3 BACKBOXES

A. Locknuts and Bushings

1. Fasten conduits to sheet metal boxes with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing.
2. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70.

B. Provide boxes in communication raceway systems at least every 100 feet and /or when 180 degrees in bends are exceeded when installing conduit on the interior of a building.

C. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, or when surface mounted on interior walls exposed up to 7 feet above floors and walkways, and when specifically indicated.

D. Boxes in other locations shall be sheet steel, except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic conduit system.

E. Boxes for telecommunications shall be minimum 4 11/16 inches square and 2 1/8 inches deep.

F. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers.

G. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with outside of exterior surfaces.

H. Backbox Supports

1. Backboxes installed in a sheet rock wall or ceiling shall be supported using the Caddy box mounting bracket or equivalent.
2. Support boxes installed flush in suspended ceilings tiles with T-bar bracket/bridge connected to ceiling grid.
3. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. Threaded studs driven in by powder charge and provided with lock washers and nuts or nail-type nylon anchors may be used in lieu of wood screws, expansion shields, or machine screws. In open overhead spaces.
4. Boxes installed in a wall shall be flush with the wall upon completion.
5. Mounting Heights of Boxes

a. Mount telecommunications outlets at height(s) as indicated on the Technology Drawings.

3.4 FLOORBOXES / POKE THRU DEVICES

A. Coordinate insert requirements with Division 26 prior to Pre-Construction Submittal.

B. Indicate conduit stub-up location on pre-construction shop drawings and as-built drawings.

3.5 PULLBOXES / JUNCTION BOXES

A. Support sheet metal boxes directly from building structure or by bar hangers.

B. Boxes mounted overhead shall be no more than 5 feet above accessible (lay-in) ceiling.

C. Pullboxes for concealed conduits routed above inaccessible ceiling shall be accessible via an access panel. Confirm acceptable location in writing with Architect/Design Consultant prior to installation. Review reflected ceiling plans prior to Bid and include associated costs for additional access panels for required pullboxes for communications conduit with Bid.

1. Access panels shall be 30” by 30”; color, style, manufacturer as approved by Architect.

D. Size pullboxes per the following table:

Conduit Trade Size	Width	Length	Depth	Width Increase for Additional Conduit (of same size)
1"	4"	4"	2-1/8"	Not applicable
1-1/4"	6"	20"	3"	3"
1-1/2"	8"	28"	4"	4"
2"	8"	36"	4"	5"
2-1/2"	10"	42"	5"	6"
3"	12"	48"	5"	6"
4"	16"	60"	8"	6"

E. Transition Point Enclosure

1. Where conduit for slab-on-grade floorboxes is not routed underground to serving Communications Rooms – and instead stubs up into accessible ceiling space - a transition point enclosure is required.
2. Transition Point Enclosure requirements:

a. 24” x 12” x 12” (minimum size) NEMA 1 enclosure with 1RU, 2RU, or 3RU wall bracket (Chatsworth 11583-719, Middle Atlantic VPM-2, or equal).
b. Enclosure shall be located above accessible (lay-in) ceiling.
c. Conduit from floorbox shall stub directly into enclosure.
d. Provide knockout bushings for number of 1” knockouts to support number of cables installed.
e. Each Transition Point Enclosure can support multiple floorboxes, up to 20 total Category cables.

3.6 SURFACE RACEWAYS AND BOXES

A. Surface Raceways and Boxes are not allowed, except where specifically identified on the Drawings.

B. Where surface raceway meets the ceiling, provide “boot” accessory.

C. Attach back part of surface raceway to wall every 4 feet or less with screw or other appropriate form of permanent installation. Use of adhesive to mount raceway to the wall is prohibited.

3.7 WIRE-MESH CABLE TRAY

A. Coordinate with all other disciplines to ensure cable tray routing and installation is coordinated with other systems.

B. Coordination with all other disciplines to ensure the 12-inch clearance above the tray is maintained.

C. Any elevation changes shall have radius drops installed to support the cables properly.

D. Install cable trays parallel with or at right angles to ceilings, walls, and structural members. Utilize 45-degree off-sets/routing to change elevation and horizontal routing.

E. Provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

F. Where cable trays encounter a non-fire-, smoke-, or acoustically-rated wall, cut opening through wall to

facilitate continuous cable tray installation through wall.

G. Where cable trays encounter fire, smoke, or acoustically-rated wall, stop cable tray and provide Fire-or Smoke-Rated Pathway Devices. Provide number of devices to match square-inch capacity of cable tray. Devices shall be ganged together with manufacturer-specific accessory.

H. Where cable trays encounter more than 10 feet of inaccessible (gypsum board) ceiling, stop cable tray and provided number of 4" conduits over inaccessible ceiling to match square-inch capacity of cable tray, per the following table:

Cable Tray Size	Quantity of 4" Conduits
2"x8"	2
2"x12"	3
4"x12", 2"x24"	4
4"x18", 6"x12"	5
4"x24", 6"x18"	7
6"x24"	10

I. Ground and bond cable tray in accordance with NFPA 70, TIA-607, and NECA/BICSI-607.

1. Bond cable tray to the Telecom Ground Bar in each Communications Rooms. Utilize #6 AWG conductor for lengths up 13 feet, a #4 AWG conductor for lengths of 14 to 20 feet, and a #3 AWG conductor for lengths of 21 to 26 feet. Refer to TIA 607 standard for conductor size requirements for lengths longer than 26 feet.
2. Provide ground lugs between each section of cable tray to ensure electrical continuity of cable tray installation. Where cable tray sections are separated by conduit or firestopping sleeves, provide #6 AWG bonding jumper between cable tray sections.

J. Cable Tray Supports

1. Cable tray shall be supported by a trapeze or wall support brackets. No center support brackets shall be allowed.
2. A minimum of 3/8-inch all-thread shall be used for trapeze supports.
3. Support in accordance with manufacturer recommendations but at not more than 10 foot intervals.
4. Cable tray shall be no less than 3-inches above a lay-in ceiling.
5. Cable tray shall be rigidly supported and level.
6. All-thread shall be covered from the attachment to the trapeze system to 3-inches above the tray to protect the cables from being chaffed.
7. All supports shall attach to structure or a rigid surface such as a plywood backer in a sheet rock wall.
8. Supports shall not be shared with any other discipline.

3.8 FIRESTOPPING

A. Fire-Rated Pathway Devices

1. Provide Fire-Rated Pathway Device(s) wherever Communications cabling routed above accessible ceiling needs to be routed through a fire-rated wall. Quantity and size of devices shall be sized per manufacturer's published cable fill counts, leaving 25% spare capacity.
2. Coordinate quantity, size and locations with other Division 27 Subcontractors and indicate quantity, size, location, product make and model number, and UL System number on Pre-Construction Shop Drawings.
3. Coordinate quantity, size and locations with other Division 27 Subcontractors and indicate quantity, size, location, product make and model number, and UL System number on Pre-Construction Shop Drawings.

4. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

B. Firestopping for Conduits

1. Provide firestopping components as part of a UL System for all conduit penetrations through fire-rated and smoke-rated walls and floors.
2. Coordinate locations and UL System with other Division 27 Subcontractors and indicate locations and UL System number on Pre-Construction Shop Drawings.
3. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

C. Firestopping for Backboxes

1. Provide firestopping component(s) as part of a UL tested/approved solution for backboxes located in fire-rated and smoke-rated walls.
2. Coordinate locations with other Division 27 Subcontractors and indicate locations on Pre-Construction Shop Drawings.

D. Smoke-Rated / Acoustical Pathway Device

1. Provide Smoke-Rated Pathway Device(s) wherever Communications cabling routed above accessible ceiling needs to be routed through a smoke-rated wall or through a wall of a Noise Critical Room.
2. Quantity and size of devices shall be sized per manufacturer's published cable fill counts, leaving 25% spare capacity.
3. Coordinate quantity, size and locations with other Division 27 Subcontractors and indicate quantity, size, location, product make and model number, and UL System number on Pre-Construction Shop Drawings.
4. For smoke-rated partitions: Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

E. Fire-rated Conduit (Circuit Integrity) Wrap

1. Provide Fire-rated Conduit (Circuit Integrity) Wrap for certain Communications conduits for the following systems:
    a. Section 275129 Two-Way Communications System
    b. Section 275319 Emergency Responder Radio Coverage (ERRC) DAS
2. Coordinate conduit size and lengths requiring wrap with Subcontractors of those sections prior to Bid and include cost to provide that wrap in the Bid.

3.9 LABELING

A. Wherever communications conduits stub up into Communications Room, either through the floor or wall), provide label on bottom/front half of conduit indicating communications system and far end location. Example: DATA FROM FRONT DESK FLOORBOX. At far end of these conduits, provide label indicating communications system and room name and room number. Example: DATA TO MDF 123.

B. Wherever communications conduits are installed overhead due to runs over inaccessible ceilings, provide label on bottom half of conduit at each end of the conduit indicated communications system and far end location. Example: HORIZONTAL CABLE TO LOBBY 251.

C. Provide label on cover of each pullbox / junction box identifying communications system cabling and destinations. Example: BACKBONE CABLE FROM MDF 123 TO IDF 456.

3.10 FUNCTIONAL AND PERFORMANCE TESTING

A. Refer to Section 27 00 10 for general Functional and Performance Testing requirements.

B. The following additional testing requirements shall be provided:

1. Cable Tray Two-Point Ground/Continuity Testing

a. Prior to the two-point ground testing, a visual inspection shall be performed to verify that the bonding and grounding system is installed according to the Contract Documents and in compliance with the TIA-607 Standard.
b. All testing shall be conducted prior to any active equipment being installed.
c. The Contractor shall use an earth ground resistance tester that is configured for a continuity test. This is also known as a two-point tester or a “dead earth” test.
d. Prior to the two-point continuity test conduct a voltage test to ensure there is no stray voltage in the system.
e. The testing shall include but is not limited to the following points.

1) Cable tray to electrical ground in ER/TR.
2) Cable tray to the building steel (if present).
3) Cable tray to each SBB/TGB.

f. Per the TIA-607, the maximum value for resistance between any point in the telecommunications bonding and grounding system and the building’s electrical grounding electrode system is 100 milliohms. In the case of long conductor runs, the resistance of the conductor must be factored into the total resistance. For example 1 km of a No. 3/0 conductor has a resistance of 0.2028 ohms. (0.06180 ohms per 1000 ft.)

3.11 FIELD OBSERVATIONS

A. Refer to Section 27 00 10 for Field Observation requirements.

3.12 DEMONSTRATION, TRAINING, AND ADJUSTMENTS

A. Refer to Section 27 00 10 for general Demonstration, Training, and Adjustment requirements.

B. Provide the following additional requirements:

1. Conduct (1) 1-hour site walk with Owner after pathways have been installed but prior to installation of suspended ceiling; point out pathway and pull box locations.

3.13 MAINTENANCE

A. Refer to Section 27 00 10 for Warranty Service and One Year Warranty Check requirements.

END OF SECTION

SECTION 27 10 00 - STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.1 This section identifies the requirements, technical design, and specifications for the structured cabling system at the Fort Bend ISD Willowridge High School, located in Houston, Texas ("Owner"). The structured cabling system as specified is an Industry-Standard Category 6 and 6A structured cabling system and includes backbone cabling, horizontal cabling and equipment room hardware as specified.

1.2 The Contractor shall provide a Panduit Manufacturer's 25-Year Performance Certification for the installed structured cabling system.

1.3 Contractor shall have PANDUIT GOLD level certification at time of the BID/PROPOSAL, Silver level certification is acceptable with FBISD approval. Approval of Silver level contractor must be in writing at time of proposal.

1.4 Contractor shall include materials, equipment, and labor necessary to provide a complete and functional structured cabling system regardless of any items not listed or described in this specification or associated drawings.

1.5 REQUIREMENTS TABLE OF CONTENT

1.5 Contractor Experience Requirements

1.6 Submittal Requirements

2.2 Acceptable Manufacturers

3.1 Codes, Standard, and Regulations

3.3 General Requirements

3.4 System Requirements

3.5 Testing Requirements

3.6 Project Closeout Documentation

1.6 RELATED REQUIREMENTS

A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 1 apply to the work specified in Division 27 and shall be complied with in every respect. The Contractor shall examine all of the items which make up the Contract Documents and shall coordinate them with the work on the project.

B. Contractor Experience Requirements

1. The Contractor shall be a **Panduit Gold Certified** prior to submitting a bid for the work.

2. The Contractor shall possess all relevant Manufacturer Certifications (i.e. structured cable systems, testing equipment, etc.,) for both the company and individual technicians and full time employees of the company, prior to submitting a bid for the work.

3. The Contractor's Project Manager shall be a Registered Communications Distribution Designer (RCDD), full-time employee of the company and at all onsite coordination meetings. Subcontracting of RCDD certification is NOT ALLOWED

4. The Contractor shall have a minimum of (2) certified BICSI and Panduit Installers, full-time employees of the company and on onsite at all times. Subcontracting of BICSI Technicians is NOT ALLOWED

5. RCDD and BICSI Certified Technicians will be present at the following meeting:

   a. Low Voltage Preinstallation Meeting

b. Cabling System Pathway Mockup

c. Owner walks / System inspections

d. Coordination Meetings

e. And Other events as requested by the Owner

6. The Contractor shall have been in business for a minimum of five (5) years.

7. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a 75-mile radius of the project site.

8. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.

C. Before the installation and rough-in of conduits for technology and audiovisual outlets in the typical classroom the Contractor shall mock up one classroom and one lab with respect to power, data, and audiovisual backboxes rough-ins for approval by the OAC team.

D. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

1.7 SUBMITTAL REQUIREMENTS

A. Pre-Installation Submittal

1. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Architect/Design Consultant.

2. Contractor shall ensure submittals are submitted in a timely manner to ensure all products can be ordered and received on site in order to not cause any delays. If there are any concerns with any products having long lead times, those products shall be clearly identified in writing so the review and approval can be expedited.

3. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e., product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product certifications for installers, etc.). Submittals not in the proper sequence will not be approved.

4. Manufacturer product data sheets for each proposed system component.

a. For product data sheets containing more than one (1) part number or product, the Contractor shall clearly identify the specific part number or product being submitted. Product data sheets without the part number clearly identified will not be approved.

5. Manufacturer Product Certifications for Company.

6. Manufacturer Product Certifications for Installers.

7. Manufacturer Certifications for testing equipment technicians.

8. Manufacturer Certifications for testing equipment calibration.

9. RCDD Certificate for Contractor's Project Manager, full-time employee of the company and at all onsite coordination meetings.

10. BICSI and Panduit Certificate for Contractor's (2) Onsite Installers, full-time employees of the company and on onsite at all times

11. Manufacturer Warranty letter.

12. Documentation indicating that Contractor has been in business for (5) years.

13. Address of Contractor's local office within a 75-mile radius of the project site.

14. Quantity of full-time local technicians within a 75-mile radius of the project site.

15. List of five (5) contractor-installed projects of a similar size and scope that have been in operation for at least (1) year. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, Brief Description of Project, Client Point of Contact Name and Phone Number.

16. List of completed and ongoing projects with the Owner. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, and Brief Description of Project.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The following sections specifically list the acceptable equipment types and items for this project.

B. Architect/Design Consultant will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.

C. Proposed equivalent items must be approved in writing by the Architect/Design Consultant prior to purchase or installation. Proposed equivalent items must meet or exceed these specifications and the specifications of the specified item.

D. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall substitute the appropriate equivalent manufacturer's part number.

E. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished.

F. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.

G. All wiring, equipment, and installation materials shall be new and of the highest quality.

H. Labels on all cabling, materials, and equipment must indicate a nationally recognized testing laboratory.

I. Original Equipment Manufacturer (OEM) documentation must be provided to the Architect/Design Consultant which certifies performance characteristics and compliance with ANSI/TIA/EIA 568-C standards.

J. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Architect/Design Consultant prior to submitting a proposal for this work. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues and the Contractor will have all products on-site when needed to complete the job as required.

2.2 ACCEPTABLE MANUFACTURERS

A. Fiber Optic Backbone Cable

1. Indoor (Plenum)

a. 50um OM3 024 Fiber indoor Armored Cable, Plenum

1) Panduit Part Number – FOPPX24Y

2) Corning Equivalent

B. Copper Backbone Cable

1. Indoor (Blue Sheath)

a. (3) Category 5e 24 AWG Unshielded Twisted Pair (UTP) Plenum

1) Panduit TX6000 Part Number – PUP5C04BU-F

2) General GenSPEED 6 Part Number – 5131278E

3) Commscope Part Number 2061F BL 4/24 W1000

4) Belden Cable Part Number 1585A D151000

C. Horizontal Cable

1. Category 6 UTP Plenum

a. Network Access (Blue Sheath)

1) Panduit TX6000 Part Number – PUP6004BU-UY

2) General GenSPEED 6 Part Number – 7131900

3) Commscope Part Number CS37P BLU

4) Belden Cable Part Number 4813 D15A1000

b. Wireless Access Points (Green Sheath) Cat 6A

1) Panduit TX6A Part Number – PUP6XHD04GR-G

2) General GenSPEED 10 MTP Gen 5 Part Number – 7151853

3) Commscope Part Number 2091B GRN

4) Belden Cable 10GXW13 0051000

c. IP Security Camera (Orange Sheath)

1) Panduit TX6000 Part Number – PUP6004OR-UY

2) General GenSPEED 6 Part Number – 7131905

3) Commscope Part Number CS37P ORG

4) Belden Cable Part Number 4813 003A1001 (minimum 5,000’ order)

2. Category 6 UTP Flooded

a. Indoor/Outdoor Copper Cable, category 6, UTP, 4-pair, 24 AWG, black (Black Sheath)

1) CommScope Part Number – CS34P-IO

2) Belden Cable Part Number – 2146A

D. Fiber Optic Cable Termination

1. 2RU Fiber Enclosure

a. Panduit 2RU Rack Mounted Fiber Optic Enclosure – Part Number FRME2U

b. Corning Equivalent

2. 50µm Multi-Mode Fiber Adapter Plate

a. Panduit 50um Multimode 10Gig OM3/4, LC,12 fibers, Zirconia Ceramic Sleeve Aqua

1) Panduit - Part Number – FAP6WAQDLCZ

2) Corning Equivalent

3. Fiber Blank Plate

a. Panduit Blank Metal Adapter Plate – Part Number FAPB

b. Corning Equivalent

4. 50µm Multi-Mode pig-tail LC Connectors

a. Panduit OM3, 1 fiber, 900µm buffered fiber, LC to pigtail multimode simplex pigtail – Part Number – FX1BN1NNNSNM001

b. Corning Equivalent

5. Loose Tube Fiber Fan-Out Kit

a. Panduit 36" Fiber Optic Fan-Out Kit, 12-fiber – Part Number – FO12CB

b. Corning Equivalent

6. Fiber Optic Slice Module

a. Panduit – FOSMF

b. Corning Equivalent

7. Fiber Optic Fusion Splice Sleeves

E. Copper Cable Termination

1. Building Entrance Terminals

1) Category 6 / 6A POE Rated Lightning Protection

a) Field End

(1) DITEK Part Number – DTK-MRJPOES

(2) DITEK CAT 6A POE Part Number – DTK-MRJETHS

b) Equipment Room/Telecommunications Room End

(1) Rack Mount Face Plate up to 12 Ports – DITEK Part Number – DTK-VM12RM

(i) Hinged Wall Mount Bracket 2RU – WBH2

(ii) Panduit Rack Cabling Manager - Part Number – NMF1

(iii) DITEK Versa-Module Power Over Ethernet Surge Protector-DTK-VM45POE

(iv) DITEK Versa-Module Plug – DTK-RM12FPPLUG for unused ports on the patch panel

(2) Wall Mount Face Plate up to 6 Ports – DITEK Part Number – DTK-VM6WM

(i) DITEK Versa-Module Power Over Ethernet Surge Protector- DTK-VM45POE

(ii) DITEK Versa-Module Plug – DTK-RM12FPPLUG for unused ports on the patch panel

(3) DITEK CAT 6 POE – DITEK Part Number – DTK-MRJPOEM

(4) 10 Gigabit Category 6A PoE Surge Protector – DTK-110RJC6APOE

(5) DITEK CAT 6A POE Part Number – DTK-MRJETHS

c) Contractor shall place WBH2 and DITEK's Equipment on the wall behind rack of WAPs and security camera patch panels.

d) Contractor shall terminate all osp, and indoor/outdoor cat6 / 6A cables for exterior security cameras and wireless access point to the DITEK's appropriate equipment.

*Contractor shall coordinate with FBISD IT Department for the installation of the cables from DITEK's appropriate equipment to the owner's network switch.

2. Backbone Cable Termination Panels

a. Rack Mounted Voice Patch Panels

1) Panduit Cat 5e 1RU 24-Port angled patch panel– Part Number DPA245E88TGY

a) Two IDF's per 24 port patch panel, terminate 1 pair per port.

*Example: (1) 24 port patch panel: IDF#1 = ports 1-12, IDF #2 = ports 13-24

b. Strain Relief Bar

1) Panduit Strain relief bar extends 5 inches off the rack to support and manage cables Part Number - SRB19D5BL

c. Termination Block Kit Components

1) Panduit 5e 110-Style Wall-Mount Wiring Block Kit w/ Legs, 100-Pair – Part Number – P110KB1004Y

d. Jumper Trough with Legs

1) Part Number - P110JTW-X

3. Horizontal Cable Termination Panels

a. Rack Mounted Data Patch Panels

1) Category 6 2RU 48-Port Unloaded Angled Patch Panels Part – Number CPPA48FMWBLY

2) Category 6A 2RU 48-Port Unloaded Angled Patch Panels Part – Number CPPA48FMWBLY

b. Strain Relief Bar

1) Panduit Strain relief bar extends 5 inches off the rack to support and manage cables Part Number - SRB19D5BL

c. Blank Inserts (Black)

1) Panduit Mini-Com Blank Module for unused ports – Part Number – CMBBL-X

4. Category 6/6A Modular Jacks

a. Network Access

1) Equipment Room/Telecommunications Room End (Blue)

a) Panduit Mini-com TX6 Plus UTP Jack Modules Part No. CJ688TGBU

2) Field End (Blue)

a) Panduit Mini-Com TX6 Plus UTP Jack Modules Part No. CJ688TGBU

b. Wireless Access Points (Cat 6A)

1) Equipment Room/Telecommunications Room End (Green)

a) Panduit Mini-Com Cat 6A UTP Jack Modules Part No. CJ6X88TGGR

2) Field End (Green)

a) Panduit Mini-Com Cat 6A UTP Jack Modules Part No. CJ6X88TGGR

c. IP Security Camera

1) Equipment Room/Telecommunications Room End (Orange)

a) Panduit Mini-Com TX6 Plus UTP Jack Modules Part No. CJ688TGOR

2) Field End (Orange)

a) Panduit Mini-Com TX6 Plus UTP Jack Modules Part No. CJ688TGOR

d. Wet Areas

1) Field End

a) Category 6, RJ45, black industrial bulkhead connector with protective cover Part Number - IAEBH6

5. Telecommunications Faceplates with Designation Window

a. 6-Port Single Gang Flush

1) Panduit Mini-Com Stainless Steel Faceplates with Labels Part No. CFPL6SY

2) Panduit Mini-Com Executive Series Single Gang Faceplates with Labels Part No. CFPE6WHY

*Contractor shall coordinate with owner/architect prior to purchase of

Panduit faceplates.

b) 4-Port Single Gang Flush

1) Panduit Mini-Com Stainless Steel Faceplates with Labels Part No. CFPL4SY

2) Panduit Mini-Com Executive Series Single Gang Faceplates with Labels Part No. CFPE4WHY

*Contractor shall coordinate with owner/architect prior to purchase of Panduit faceplates.

c) Wall Phone Single Gang Plate

1) Panduit Stainless steel phone plate with Giga-TX ™ Style Category 6 Keystone Jack Module. Part Number KWP6PY

2. 2-Port Surface Mount Box (White)

a) Panduit Mini-Com Surface Mount Box Part No. CBX2WH-A

3. 4-Port Surface Mount Box (White)

a) Panduit Mini-Com Surface Mount Box Part No. CBX4WH-A

4. Blank Insert (White)

a) Panduit Mini-Com Blank Module – Part No. CMBWH-X

5. QuickPort In-Ceiling Bracket with Drop Ceiling Clip

a) Leviton - QuickPort In-Ceiling Bracket – Part No. 49223-CBC

F. Equipment Racks, Cabinets, Cable Management, and Accessories

1. Two-Post Rack - 19” x 84” Open Frame (Black)

a) Panduit – Part Number R2P

2. Vertical Cable Managers (Black)

a) Panduit 10” Double Sided Vertical Cabling Section - Part Number – PR2VSD10

3. Horizontal Cable Managers (Black)

a) Panduit Rack Cabling Manager - Part Number - NMF2

4. Vertical Power Strip for 7’ Equipment Rack with standoff brackets

a) Tripp-Lite Vertical Power Strip with Meter and– Part Number PDUMV30HVNETLX

b) Panduit Vertical PDU Mounting Bracket – Part Number R2PPDUB

*Vertical power strip and standoff bracket shall not interfere with the network switches.

G. Cable Runway (Ladder Type)

1. Universal Cable Runway

a) 12-inch Chatsworth - Part Number 10250-712

2. Cable Runway Radius Drop, Cross Member

b) 12-inch Chatsworth - Part Number 12100-712

3. Cable Runway Radius Drop, Stringer

a) Chatsworth - Part Number 12101-711

4. Cable Runway Butt-Splice Kit

a) Chatsworth - Part Number 11301-701

5. Cable Runway Junction-Splice Kit

a) Chatsworth - Part Number 11302-701

6. Rack-to-Runway Mounting Kit

a) 9 to 12-inch runway Chatsworth - Part Number 10595-712

7. Cable Runway Elevation Kit for Racks/Cabinets

a) Chatsworth - Part Number 10506-706

8. Triangular Support Bracket, Aluminum
    a) 6 to 12-inch runway Chatsworth - Part Number 11312-712
9. Wall Angle Support Kit, Cable Runway
    a) 12-inch runway Chatsworth - Part Number 11421-712
10. 90 Degree Runway-Splice Kit
    a) Chatsworth - Part Number 11314-701
11. 45 Degree Runway-Splice Kit
    a) Chatsworth - Part Number 11313-701
12. Foot Kit, Cable Runway
    a) Chatsworth - Part Number 11309-701
13. Vertical Wall Brackets (pair)
    a) Chatsworth - Part Number 10608-701
14. Threaded Ceiling Kit, Cable Runway
    a) Chatsworth - Part Number 11310-001
15. Threaded Rod Cover
    a) Chatsworth - Part Number 11085-001
16. Protective End Caps for Cable Runway
    a) Chatsworth - Part Number 10642-001
17. End Closing Kit, Cable Runway
    a) Chatsworth - Part Number 11700-712

H. Pathway Cable Support
1. Panduit J-Mod Cable Support System
2. Erico – CADDY CAT LINKS J-Hook Series
3. Wyr-Grid – WG12BL10 (minimum)

a. Contractor to shall use associated transitions, hardware to provide solid support and grounding (sized appropriately according to manufacture specifications) to be used outside the MDF/IDF and a minimum of 20’ in any direction cabling trunks leave MDF/IDF. The 20' requirement is for cable tray not j-hooks.

b. Wire basket tray shall have a 6” clearance from ceiling tile to the bottom of basket tray and 12” clearance from the top of the basket tray to HVAC Units, HVAC duct, heating ducts, and heating equipment, etc.

c. Wire basket tray shall have a 12” clearance from the side of basket tray to HVAC Units, HVAC duct, heating ducts, and heating equipment, etc.

d. Wire basket tray shall be properly grounded and bonded as per industry standards.

I. Grounding and Bonding

1. IDF Grounding Bus Bar, 12”
    a) Panduit Part Number - GB4B0612TPI-1
    b) Chatsworth - Part Number 13622-012
2. Grounding strip
    a) Panduit Part Number - RGS134-1Y
3. Equipment Bonding Jumper
    a) Panduit Part Number - GJS6xxU (GJS660U)
        *xx – denotes length
4. Cable Runway Ground Strap Kit
    a) Chatsworth - Part Number 40164-001
5. Compression Lugs
    a) Panduit - Part Number - LCC6-14JAWH-L
6. #6 AWG Solid Green Insulation Ground Wire
    a) Superior Essex - Part Number 12-018-04
7. #3/0 Stranded Green Insulation Ground Wire
8. Cable Sheath Bonding Clamp

J. Labeling

1. Permanent Labels for Fiber Optic Cables
    a) Laser/Ink Jet Self Laminating Labels
        1) Panduit Part Number Series – S100X******
2. Permanent Labels for Copper Cables
    a) Laser/Ink Jet Self Laminating Labels
        1) Panduit Part Number Series – S100X******
3. Permanent Labels for Backbone Fiber Optic Cables
    a) Self-Laminating Fiber Optic Cable Marker Tags
        1) Panduit Part Number – PST-FO
4. Permanent Labels for Innerduct
    a) Self-Laminating Fiber Optic Cable Marker Tags
        1) Panduit Part Number – PST-FO
            To be used for Innerduct with fiber installed.
        2) Panduit Part Number – PST-FOBLNK

To be used for empty spare Innerduct

5. Permanent Labels for Patch Panels and Ceiling Grid

    a) Panduit Component Label

6. Permanent Labels for Faceplates and Ceiling Grid

    a) Panduit Component Label

7. Permanent Labels for Grounding Cables a. Laser/Ink Jet Self Laminating Labels 1) Panduit Part Number Series – S100X******

K. Fire Stop

1. STI Spec Seal Part Number

    a) MDF/IDF - EZ-Path 44+Series

    b) EZ-Path

2. SpecSeal Fire Stop Products (SSP)

    a) Sleeves - Series SSP Fire Stop Putty - Part Number – SSP100

L. Plywood

1. 8’ H x 4’ W x ¾” Sheets of BC grade fire-rated plywood

M. Fire Retardant Paint (White)

N. Fiber Patch Cables

1. Multi-Mode Fiber Patch Cords

    a) Panduit LC - LC MM Fiber Optic Patch Cords Part Number - FXE10-10M3Y

    b) Corning Equivalent

    *Contractor shall confirm with FBISD Technology Department on the lengths, colors and quantities prior to purchase. Quantity is minimum of one patch cable for every terminated strand of fiber.

O. Copper Patch Cables

1. Panduit TX6 Plus Category 6 /6A UTP Patch Cord – Part Number UTPSPxxzzY (cat 6) UTP28X (cat 6A)

    *xx – denotes length, *zz denotes color other than off white

    a) Panduit - Data/Voice (Blue) Part Number -UTPSPxxBUY

    b) Panduit – Wireless Access Point (Green) Cat 6A Part Number -UTP28XxxGR

    c) Commscope – Exterior Wireless Access Point (OSP) Cat 6A – Part Number –C015582

        a. For Exterior Patch Cables, Contractor to provide the recommended length from terminated category cable to exterior equipment.

    d) Panduit – Security Camera (Orange) Part Number -UTPSPxxORY

    e) Commscope – Security Exterior Camera (OSP) Part Number – 26

a. For Exterior Patch Cables, Contractor to provide a recommended length from terminated category cable to exterior equipment.

f) Panduit – Kronos, HVAC, and DSX (Violet) Part Number -UTPSPxxVLY

*Contractor shall confirm with FBISD Technology Department on the lengths, colors and quantities prior to purchase. Quantity is minimum of two patch cables for every terminated category cable.

PART 3 - EXECUTION

3.1 CODES, STANDARDS, REGULATIONS

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

1. ASTM B 1 (2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
2. ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
3. ASTM D 1557 (2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
4. ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

C. Alliance for Telecommunications Industry Solutions (ATIS)

D. Building Industry Consulting Service International (BICSI)

1. Telecommunications Distribution Methods Manual 13th Edition
2. Outside Plant Design Reference Manual 5th Edition
3. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
4. NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling
5. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

E. Electronics Industry Alliance (EIA)

F. Federal Communications Commission (FCC)

1. FCC Part 15, Radiated Emissions Limits, revised 1998
2. FCC Part 68, Connection of Terminal Equipment to the Telephone Network, revised 1998
3. FCC Part 76, Cable Television Service, revised 1998

G. Insulated Cable Engineers Association (ICEA)

1. ICEA S-87-640 (2006) Fiber Optic Outside Plant Communications Cable
2. ICEA S-98-688 (2006) Broadband Twisted Pair, Telecommunications Cable Aircore, Polyolefin Insulated Copper Conductors
3. ICEA S-99-689 (2006) Broadband Twisted Pair Telecommunications Cable Filled, Polyolefin Insulated Copper Conductors

H. International Electrotechnical Commission (IEC)

I. Institute of Electrical and Electronics Engineers, Inc. (IEEE)

1. IEEE Standard 81-1983, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System

2. IEEE Standard 1100-1999, Recommended for practice for Powering and Grounding Sensitive

3. Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)

4. IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code

5. IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms

J. International Organization for Standardization (ISO)

1. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)

2. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995

3. ISO/IEC 14763-1, Information Technology-Implementatio, and Operation of Customer Premises Cabling-Administration, 1999

4. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995

5. ISO/IEC 14763-1, Information Technology-Implementation, and Operation of Customer Premises Cabling-Administration, 1999

K. National Cable Television Association (NCTA)

L. National Electrical Manufacturers Association (NEMA)

1. NEMA C62.61 (1993) Gas Tube Surge Arresters on Wire Line Telephone Circuits

M. National Fire Protection Association (NFPA)

1. NFPA-70, National Electrical Code

2. NFPA-75, Protection of Electronic Computer Data Processing Equipment.

3. NFPA-101, Life Safety Code

4. NFPA-297, Guide on Principles and Practices for Telecommunications Systems

5. NFPA-780, Standard for the Installation of Lightning Protection Systems.

N. National Institute Standards and Technology (NIST)

O. Occupational Safety and Health Administration (OSHA)

P. Telecommunications Industry Association (TIA)

1. ANSI/TIA-568.0-D-1, Generic Telecommunications Cabling for Customer Premises.

2. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard.

3. ANSI/TIA -568.0-D.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard.

4. ANSI/TIA-568.3-D-1, Optical Fiber Cabling Components Standard.

5. ANSI/TIA–569-E Commercial Building Standard for Telecommunications Pathways and Spaces.

6. ANSI/TIA-606-C, Administration Standard for the Telecommunications Infrastructure.

7. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.

8. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.

Q. U.S. Department of Agriculture (USDA)

1. RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment, and Construction

2. RUS Bull 1751F-643 (2002) Underground Plant Design

3. RUS Bull 1751F-815 (1979) Electrical Protection of Outside Plant

4. RUS Bull 1753F-201 (1997) Acceptance Tests of Telecommunications Plant (PC-4)

5. RUS Bull 1753F-401 (1995) Splicing Copper and Fiber Optic Cables (PC-2)

6. RUS Bull 345-65 (1985) Shield Bonding Connectors (PE-65)

7. RUS Bull 345-72 (1985) Filled Splice Closures (PE-74)

8. RUS Bull 345-83 (1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)

R. Underwriters Laboratories, Inc. (UL)

1. UL 510 (2005; Rev thru Aug 2005) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape

2. UL 910 (NFPA 262 1990) Applicable Flame Test

3.2 In the event of any conflicts between documents referenced herein and the contents of this specification, the Contractor shall notify the Architect/Design Consultant in writing of any such occurrences before purchasing or installing any equipment or materials. The Architect/Design Consultant will notify the Contractor of any actions required to resolve these conflicts. Such actions may include but are not limited to design changes, equipment, materials and/or installation changes. In any event, Contractor shall not supersede specifications and standards from the latest NFPA and NEC publications. In the event of any conflicts between Standards and Code, the more stringent shall take precedence.

3.3 GENERAL REQUIREMENTS

A. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), State of Texas, the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the aforementioned laws, ordinances, and rules, the matter shall be referred to the Architect/Design Consultant for direction before proceeding with that part of the work.

B. The Contractor shall be responsible for coordination with other trades to ensure any conflicts or potential conflicts are resolved prior to any work beginning on the project.

C. The Contractor shall install the materials in accordance with these specifications and the manufacturer’s installation guidelines.

D. No deviations from the plans or specifications shall be made without full consent in writing of the Architect/Design Consultant. The Contractor shall have written approval from the Architect/Design Consultant for any additional work beyond the Contract Documents prior to beginning such work. If the

Contractor does not obtain written approval from the Architect/Design Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.

E. The Contractor shall obtain written permission from the Architect/Design Consultant before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to girders, beams, floors, walls, roofs, or ceilings.

F. Contractor shall notify the Architect/Design Consultant a minimum of (2) weeks prior to beginning work and will participate in a pre-construction meeting with the Architect/Design Consultant to perform a walkthrough, review the scope of work, schedule, and escalation procedures.

G. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap cable, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.

H. Equipment and materials installed by the Contractor shall be free of defects and damage.

I. Contractor shall be responsible for the repair of any damage caused by the contractor during the installation.

J. Contractor shall test all cables prior to installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.

K. Contractor shall maintain a set of working specifications, design drawings, and record drawings to be kept on site at all times and shall update the record drawings with any changes on a weekly basis. Record drawings shall be made available for inspection at the request of the Architect/Design Consultant.

L. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.

M. Equipment and materials shall be delivered and stored in accordance with the manufacturer's guidelines at the Contractor's expense.

N. Contractor shall make all stored equipment and materials available for inspection at the request of the Architect/Design Consultant.

O. All equipment and material used in the installation shall be approved by the manufacturer for the environment in which it is being installed.

P. Cables shall be properly supported in accordance with industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.

Q. Contractor shall be responsible to properly protect information outlets from damage by other trades during construction.

R. Cables shall be routed at 90-degree angles to the building structure. At no time shall a diagonal pull be installed.

S. The Contractor shall not install cables in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be removed and replaced at no cost to the Owner.

3.4 SYSTEM REQUIREMENTS

A. Quantities listed are for reference only, contractor is responsible for furnishing materials as required to provide a complete and functioning system. Where quantities are not noted, they may be obtained from the drawings. In the event of a discrepancy between the specifications and the drawings, the greater quantity shall be furnished.

B. Intra-Building Cable Plant

1. Fiber Optic Cable

a) 50 µm Multi-Mode

1) Contractor shall furnish and install plenum rated indoor/outdoor rated fiber optic cables in contractor-furnished and installed plenum rated innerduct.

2) Contractor shall install a 10-foot service loop using a U-Shape configuration mounted and stored on the wall above the ladder rack.

3) Cables shall be routed utilizing the pathways as indicated in the technology drawings.

4) The contractor shall furnish and install:

a) Plenum rated armored fiber optic cable from MDF to IDF as indicated on the technology drawings.

2. Fiber Optic Termination

a) Contractor shall terminate all installed fiber optic strands with connectors and place into fiber optic enclosures as indicated in the technology drawings.

b) Contractor shall furnish fiber optic enclosures and coupler panels for all fiber optic strands and blank panels for all unused slots.

c) The Contractor shall furnish and install:

1) Fiber enclosure(s) inside MDF as indicated on the technology drawings.

2) Fiber enclosure(s) inside IDF as indicated on the technology drawings.

3. Copper Cable

a) High Pair Count

1) The Contractor shall furnish and install plenum-rated copper cables.

2) The Contractor shall install a 10-foot service loop using a U-Shape configuration mounted at the ends of each cable, mounted, and stored on the wall above the ladder rack.

3) Cables shall be routed utilizing the pathways as indicated in the technology drawings.

4) The contractor shall furnish and install:

a) (3) Category 5e plenum rated cable(s) from MDF to IDF as indicated on the technology drawings.

4. High Pair Count Termination

a) Patch Panels

1) The Contractor shall furnish and install rack mounted voice patch panels.

a) Two IDF’s per 24 port patch panel, terminate 1 pair per port.

*Example: (1) 24 port patch panel: IDF#1 = ports 1-12, IDF #2 = ports 13-24

2) The Contractor shall furnish and install:

a) 24-port voice angled patch panel(s) inside MDF as indicated on the technology drawings.

b) 24-port voice angled patch panel(s) inside IDF as indicated on the technology drawings.

C. Horizontal Cable

1. No horizontal cable shall be longer than two hundred ninety-five (295) feet. If any station cable will be longer than two hundred ninety-five (295) feet, Contractor shall stop installation of the cable and immediately notify Architect/Design Consultant in writing. If Contractor fails to notify the Architect/Design Consultant in writing, Contractor shall replace cable at no cost to the Owner.

2. The Contractor shall furnish and install horizontal cables within each Technology Region from the respective ER or TR to each outlet location as indicated in the technology drawings.

3. The Contractor shall install a 10-foot service loop using a U-Shape configuration mounted and stored above the ladder rack in each respective Equipment Room or Telecommunications Room.

4. The Contractor shall provide a 10-foot service loop coiled (using figure eight configuration) and supported directly above the workstation outlet.

5. The Contractor shall install wet rated cat 6 cable(s) at floor boxes, and poke thru conduit(s) that are under slab or in slab.

D. Horizontal Cable Termination

1. Contractor shall terminate cables as defined by the ANSI/TIA/EIA 568-D.2 Commercial Building Wiring Standard with the EIA-568B sequence.

2. Workstations

a) Contractor shall furnish and install modular jacks to terminate UTP horizontal cables.

b) Contractor shall furnish and install faceplates, systems furniture faceplates, or surface-mount boxes to house modular jacks as indicated in the technology drawings.

1) Any unused faceplate positions shall have the appropriate number and color of blanks installed.

3. Equipment Rooms / Telecommunications Rooms

a) Horizontal Cable for Data

1) Contractor shall furnish and install Panduit angled patch panels, blank inserts (for all unused slots), and horizontal cable managers to terminate horizontal data cables as indicated in the technology drawings.

2) The Contractor shall provide and install:

a) 48-port rack mounted Panduit angled patch panel(s) in IDF as indicated on the technology drawings.

b) Provide capacity in patch panel quantity for 30% growth

b) Horizontal Cable for IP Security

1) Contractor shall furnish and install Panduit angled patch panels, blank inserts (for all unused slots), and horizontal cable managers to terminate horizontal IP security cables as indicated in the technology drawings.

2) The Contractor shall provide and install:

a) 48-port rack mounted Panduit angled patch panel(s) in IDF as indicated on the technology drawings.

b) Provide capacity in patch panel quantity for 30% growth

c) Horizontal Cable for Wireless Access Points – Cat 6A

1) Contractor shall furnish and install Panduit angled patch panels, blank inserts (for all unused slots), and horizontal cable managers to terminate horizontal wireless access point cables as indicated in the technology drawings.

2) The Contractor shall furnish and install:

a) 48-port rack mounted Panduit angled patch panel(s) in IDF as indicated on the technology drawings.

b) Provide capacity in patch panel quantity for 30% growth

4. Horizontal Cable requiring lightning protection

1) Contractor shall furnish and install lightning protection on both ends of any cables on the exterior of the building as indicated in the technology drawings.

2) All lightning protection shall be installed per manufacturer's instructions including but not limited to placement and bonding requirements.

3) The Contractor shall furnish and install:

a) DITEK's Equipment for MDF/IDFs

b) Contractor shall terminate all osp, and indoor/outdoor cat6 / 6A cables for exterior security cameras and wireless access point to the DITEK's appropriate equipment.

c) Contractor shall place DITEK's Equipment and associated hardware on the wall behind rack of WAPs and security camera patch panels.

d) Contractor shall coordinate with FBISD IT Department for the installation of the cables from DITEK's appropriate equipment to the owner's network switch.

E. Patch Cables (Snagless)

1. Fiber

a) Equipment Rooms / Telecommunications Room

1) The Contractor shall furnish and store (1) LC to LC fiber optic patch cable in the original manufacturer packaging plus 25 percent spare for each terminated strand. Patch cable length is determined as needed per MDF and IDF Room layout and shall be coordinated with FBISD Technology Department.
2) Contractor shall confirm with FBISD Technology Department on lengths and quantities prior to purchase.

2. Copper

a) Workstations

1) The Contractor shall furnish and store (1) Category 6 patch cable in original manufacturer packaging for each cable terminated plus 25 percent spare for each terminated cable.

a) Category 6 patch cables for each data/voice end user workstation outlet terminated shall be blue.

b) Category 6A patch cable for each wireless access outlet terminated shall be green.

c) Category 6A OSP patch cable for each exterior wireless access outlet terminated shall be OSP Rated

d) Category 6 patch cable for each IP camera outlet terminated shall be orange.

e) Category 6 OSP patch cable for each exterior IP camera outlet terminated shall be OSP Rated

f) Category 6 patch cable for each special system (HVAC, Kronos, and DSX) terminated shall be violet.

*Contractor shall confirm with FBISD Technology Department on the lengths, colors and quantities prior to purchase.

b) Equipment Rooms / Telecommunications Rooms

1) The Contractor shall furnish and store (1) Category 6/6A patch cable in original manufacturer packaging for each cable terminated plus 25 percent spare for each terminated cable.

a) Category 6 patch cables for each data/voice end user workstation outlet terminated shall be blue.

b) Category 6A patch cable for each wireless access outlet terminated shall be green.

c) Category 6 patch cable for each IP camera outlet terminated shall be orange.

d) Category 6 patch cable for each special system (HVAC, Kronos, DSX) terminated shall be violet.

2) Patch cable length is determined as needed per MDF / IDFs layout and shall be coordinated with Fort Bend ISD Technology Department.

* Contractor shall confirm with FBISD Technology Department the lengths, colors and quantities prior to purchase.

F. Cable Support

1. All cables shall be installed and supported in conduit systems, cable trays, cores, sleeves, etc. as indicated in the technology drawings.

2. Contractor to shall use associated transitions, hardware to provide solid support and grounding (sized appropriately according to manufacture specifications) to be used outside the MDF/IDF and a minimum of 20’ in any direction cabling trunks leave MDF/IDF. The 20' requirement is for cable tray not j-hooks.

3. Wire basket tray shall have a 6” clearance from ceiling tile to the bottom of basket tray and 12” clearance from the top of the basket tray to HVAC Units, HVAC duct, heating ducts, and heating equipment, etc.

4. Wire basket tray shall have a 12” clearance from the side of the basket tray to HVAC Units, HVAC duct, heating ducts, and heating equipment, etc.

5. Wire basket tray shall be properly grounded and bonded as per industry standards.

6. When cables leave the main pathway systems as indicated on the technology drawings, they shall be installed and supported in Contractor furnished and installed j-hooks cable supports.

7. No cable pathway shall exceed 40% fill ratio.

8. The contractor shall furnish a separate j-hook cable support pathway for each cable type (backbone fiber, backbone, copper, data, wireless access point, and security). Provide 30% growth without exceeding the 40% fill rate.

9. J-hooks cable supports shall be installed no more than five-feet (5') apart on center, using only manufacturer-approved installation methods and hardware.

10. J-hooks cable supports shall be installed no higher than 3-feet above the accessible ceiling to allow for ease of access for future moves, adds and changes

11. No grid wire shall be utilized for support only use solid supports (clips, all thread, anchors, etc.).

12. J-hooks shall be furnished with closure clips.

13. Maximum sag between supports shall not exceed twelve-inches (12").

14. Contractor shall establish j-hook cable supports pathways and shall coordinate pathways with all other disciplines. Under no-circumstances shall these pathways be used to support other low-voltage applications not included in this specification.

15. Cable Dressing

    a) No nylon cable ties shall be used at any time during the installation of the cable.

    b) Above Ceiling

        1) Contractor shall furnish and install plenum-rated hook & loop straps in plenum-rated airspaces.

            a) The Contractor shall install no more than (1) hook & loop strap between each j-hook or saddle strap or at service loop locations.

    c) Equipment Rooms / Telecommunications Rooms

        1) The Contractor shall bundle all visible cables with Contractor furnished and installed hook & loop straps.

            a) Hook & loop straps shall be installed twenty-four (24) inches apart on center.

G. Equipment Rooms / Telecommunications Room Build-Out

1. Plywood

    a) The Contractor shall furnish and install 8' H x 4' W x ¾" D sheets of BC grade fire-rated plywood as indicated in the technology drawings.

    b) The Contractor shall mount all plywood vertically starting at 24" AFF.

    c) The Contractor shall cover the plywood with two (2) coats of Contractor furnished white fire-retardant paint leaving exposed (1) fire rating stamp per sheet.

2. Cable Runway (Ladder Type)

    a) Contractor shall furnish and install cable runway using manufacturer-approved hardware and installation methods as indicated in the technology drawings.

b) Contractor shall furnish and install vertical sections of cable runway using manufacturer-approved hardware and installation methods to provide transition and support where cables enter or exit the room using a vertical pathway.

c) Contractor shall furnish and install radius drops cross member and stringers above each rack using manufacturer-approved hardware and installation methods where cables exit the horizontal section of the ladder rack.

d) Contractor shall ground and bond each cable runway section to the next utilizing ground straps and ensure metal-to-metal contact.

3. Equipment Racks and Cabinets

a) Contractor shall furnish and install equipment racks with vertical management using manufacturer approved hardware and installation methods as indicated in the technology drawings.

b) Contractor shall secure relay racks to the concrete floor utilizing expandable concrete anchors.

c) Contractor shall secure the equipment racks to the cable runway using cable runway elevation kits and manufacturer approved hardware and installation methods.

d) Contractor shall bolt all equipment racks and vertical cable managers together.

e) Contractor shall individually ground and bond each equipment rack and ensure metal-to-metal contact.

f) Contractor shall furnish and install:

1) 19” x 84" equipment rack(s) in IDF as indicated on the technology drawings

H. Grounding and Bonding

1. General

a) The Contractor shall ensure metal-to-metal contact for all terminations.

b) All materials shall be UL Listed.

c) All connections shall be made with UL Listed compression 2-hole lugs.

d) Contractor shall use an anti-oxidation compound on all connections.

e) In a metal frame (structural steel) building, where the steel framework is readily accessible within or external to the room; each TMGB/PBB and TGB/SBB shall be bonded to the vertical steel metal frame using a minimum # 6 AWG plenum rated green insulated conductor.

f) A Grounding Equalizer conductor shall be installed when required by ANSI/TIA/EIA-607-D (Interconnects multiple TBBs on the top floor and every 3rd floor in between).

g) The connection to building steel does not eliminate the requirement for the TBB or EBC to the service ground.

h) Grounding/Bonding conductors shall be labeled within (6) inches from their termination point with wrap around labels.

2. Telecommunications Main Grounding Busbar / Primary Bonding Busbar (TMGB/PBB)

a) Contractor shall furnish and install a TMGB/PBB in the Equipment Room/Main Telecommunication Room as indicated in the technology drawings.

b) TMGB/PBB shall be insulated from its support using an insulator that is listed for the purpose by a nationally recognized testing laboratory (NRTL).

c) Only one lug shall occupy a hole. No stacking lugs or “Double Lugging” shall be accepted.

3. Telecommunications Grounding Busbar / Secondary Bonding Busba (TGB/SBB)

a) Contractor shall furnish and install a TGB/SBB in each Telecommunications Room as indicated in the technology drawings.

b) TGB/SBB shall be insulated from its support using an insulator that is listed for the purpose by a nationally recognized testing laboratory (NRTL).

c) Only one lug shall occupy a hole. No stacking lugs or “Double Lugging” shall be accepted.

4. Telecommunications Bonding Backbone (TBB)

a) The Contractor shall furnish and install a TBB consisting of a minimum #6 AWG plenum rated green insulated copper conductor in a star topology between the TMGB/PBB and each TGB/SBB as indicated in the Technology drawings.

b) When exceeding (13), feet the TBB shall be sized at (2) kcmil per linear foot of conductor length up to a maximum of 750 kcmil.

c) Where the TRs are stacked the TBB shall be continuous to the uppermost TR. “T” taps shall be used to tie TGB/SBBs on floors between the TMGB/PBB and the uppermost TGB/SBB.

d) Conductor shall be sized from the TMGB/PBB to the uppermost TGB/SBB and each conductor between a “T” tap and the TGB/SBB shall be the same size as the TBB it is fed from.

5. Equipment Bonding Conductor (EBC)

a) Contractor shall furnish and install a minimum #6 AWG plenum rated green insulated conductor from the TMGB/PBB or TGB/SBB as applicable to each ladder rack system, equipment rack, cabinet, metallic raceway, lightning protector, or multi-pair cable with a metallic element. Contractor shall use an anti-oxidation compound on all connections.

b) When exceeding (13) feet the EBC shall be sized at (2) kcmil per linear foot of conductor length up to a maximum of 750 kcmil.

6. Bonding Conductor for Telecommunications (BCT)

a) Contractor shall furnish and install a minimum #6 AWG plenum rated green insulated copper conductor from the TMGB/PBB to the main building electrical service ground as indicated in the Technology drawings.

b) The installation of the BCT to the main building electrical ground shall be performed by a licensed Electrical Contractor.

c) When exceeding (13) feet the BCT shall be sized at (2) kcmil per linear foot of conductor length up to a maximum of 750 kcmil

I. System Labeling

1. Contractor shall verify room numbers and confirm the final room numbering scheme prior to generating any labels.

2. Horizontal Cables shall be labeled within (1) inches from the termination point inside the Equipment Room/Telecommunications Rooms.

3. Horizontal Cables shall be labeled within (6) inches from the termination point at the workstation end.

4. Backbone Fiber and Copper Cables shall be labeled within (12) inches of the visible end of the jacket and at each pull point location. If passing through an IDF it will be labeled when entering and leaving that IDF.

5. Fiber Innerduct shall be labeled within (12) inches of the point of entry of the fiber optic enclosure and at each pull point location. If passing through an IDF it will be labeled when entering and leaving that IDF.

6. Bonding conductors shall be labeled within (6) inches from their termination point.

7. Cables shall be labeled identically at both ends.

8. Equipment Racks

    a) Equipment racks in each Equipment/Telecommunication Room shall be labeled in sequential numeric order.

        1) Labels shall be centered on the top front of the equipment rack.

9. Cabinets

    a) Cabinets in each Equipment/Telecommunication Room shall be labeled in sequential numeric order.

        1) Labels shall be centered on the top front of the Cabinet.

10. Fiber Optic Enclosures

    a) Fiber optic enclosures shall be labeled alpha-numeric starting with the 1st fiber optic enclosure in the top of the 1st equipment rack.

    b) A label for each terminated strand shall be securely placed inside each fiber optic enclosure.

11. Backbone Cable

    a) Fiber Optic Cable

        1) Fiber optic backbone cable labels shall contain the cable origin room number, the cable destination room number, rack number, fiber strand numbers, and type (i.e., A1-R1-B1/001-012MM).

        2) Fiber optic couplers panels in fiber enclosures shall be labeled at each end by strand denoting building code, Equipment Room and/or Telecommunications Room, enclosure number, and strand number to and from respectively (i.e., A1/01/01-12 – B1/01/01-12).

    b) High Pair Count Copper Cable

        1) For high pair count copper backbone cables, the label scheme shall contain, cable origin room number, rack number, the cable destination room number, and cable pairs (i.e., A1-R1-B1/001-025).

12. Horizontal Cable

    a) Inside Equipment Rooms

        1) Horizontal cables shall be labeled at each end with the MDF/IDF room number, rack number, patch panel letter, and port number. (i.e., A1-R1-A01).

        2) Patch panels in each closet shall be labeled sequentially starting with the first Patch Panel in the top of the first relay rack (A, B, C, D, E, etc.).

3) All patch panels will indicate the room number along with the patch panel port designation. The labels shall be mechanical labels that are neatly printed with uniform font and evenly spaced across the patch panel. Room numbers will be in sequential order throughout the panels as indicated on the drawings.

4) 110-type blocks shall contain the destination room number, pair numbers, and binder pair number under each pair termination. (example)

a) 110-type block labels shall be printed on product-specific label strips and placed into label holders.

13. Workstation Faceplates

a) Cables and wall plates shall be labeled denoting origin, Equipment Room/Telecommunications Room Number, Rack Number, Patch Panel, and Port Number. (i.e., B1-R1-A01).

14. TMGB/PBB and TGB/SBB

a) TMGB/PBB and TGB/SBB shall be labeled with a unique identifier (i.e., TMGB/PBB-D100T, TGB/SBB-B123T).

15. Bonding Conductors

a) The following conductors shall be labeled at each end with the destination end and origin room number (i.e., A1 – IDFB1).

1) Bonding Conductor for Telecommunications

2) Telecommunications Bonding Backbone

3) Grounding Equalizer

4) Equipment Rack

3.5 TESTING REQUIREMENTS

A. Fiber Optic Cable

1. Installed strands shall be tested and certified in accordance with industry standards.

2. Only Manufacturer Certified Technicians shall perform testing.

3. The Contractor shall test bi-directionally end to end and certified in accordance with applicable industry standards and manufacturer certifications requirements with an OTDR field and Power Meter tester that is within their calibration period. The Contractor shall be liable for all re-testing required in the event tests are performed with non-approved test equipment or tester(s) that are not within their calibration period.

4. The Contractor shall provide calibration results from the manufacturer showing the current calibration of the testers.

5. The Contractor shall notify the Architect/Design Consultant a minimum of five (5) days in advance to observe cable testing.

6. The Architect/Design Consultant may randomly select 5% of the installed strands for test verification purposes. The Contractor shall re-test these strands in the presence of the Architect/Design Consultant and the results shall be compared to the previously Contractor submitted test results. In the event that any of the verification tests differ in results from the previously submitted test results, all testing shall be declared a failure and the Contractor shall re-test 100% of the installed strands at no cost to the Owner.

B. Copper Backbone Cable

1. Installed pairs shall be tested and certified in accordance with industry standards.

2. Only Manufacturer Certified Technicians shall perform testing.

3. The Contractor shall test and certify all copper pairs with approved field tester(s) that are within their calibration period. The Contractor shall be liable for all re-testing required in the event tests are performed with non-approved test equipment or tester(s) that are not within their calibration period.

4. The Contractor shall provide calibration results from the manufacturer showing the current calibration of the testers.

5. The Contractor shall notify the Architect/Design Consultant a minimum of five (5) days in advance to observe cable testing.

6. The Architect/Design Consultant may randomly select 5% of the installed pairs for test verification purposes. The Contractor shall re-test these pairs in the presence of the Architect/Design Consultant and the results shall be compared to the previously Contractor submitted test results. In the event that any of the verification tests differ in results from the previously submitted test results, all testing shall be declared a failure and the Contractor shall re-test 100% of the installed pairs at no cost to the Owner.

C. Category 6/6A UTP Cable

1. Cable links shall be tested in accordance with industry standards.

2. Only Manufacturer Certified Technicians shall perform testing.

3. The Contractor shall test and certify the structured cable system with approved field tester(s) that are within their calibration period. The Contractor shall be liable for all re-testing required in the event tests are performed with non-approved test equipment or tester(s) that are not within their calibration period.

4. No, Fail or *Pass results will be accepted.

5. The Contractor shall notify the Architect/Design Consultant a minimum of five (5) days in advance to observe field testing.

6. The Architect/Design Consultant may randomly select 5% of the installed links for test verification purposes. The Contractor shall re-test these links in the presence of the Architect/Design Consultant and the results shall be compared to the previously Contractor submitted test results. In the event that any of the verification tests differ in results from the previously submitted test results, all testing shall be declared a failure and the Contractor shall re-test 100% of the installed links at no cost to the Owner.

D. Grounding and Bonding

1. Main Building Ground

a) Coordinate with electrical contractor and provide a copy of their test results for the main building ground. The results shall be below 25 Ohms.

2. Two-Point Ground/Continuity Testing

a) Prior to the two-point ground testing, a visual inspection shall be performed to verify that the bonding and grounding system is installed according to the drawings and specifications and in compliance with the TIA-607-D Standard.

b) All testing shall be conducted prior to any active equipment is installed.

c) The Contractor shall use an earth ground resistance tester that is configured for a continuity test. This is also known as a two-point tester or a “dead earth” test.

d) Prior to the two-point continuity test conduct a voltage test to ensure there is no stray voltage in the system.

e) The testing shall include but is not limited to the following points.

1) Building electrical grounding electrode and the TMGB/PBB.

2) TMGB/PBB, TGB/SBB to electrical ground in ER/TR.

3) TMGB/PBB, TGB/SBB to the building steel (if present).

4) TMGB/PBB to each TGB/SBB.

5) Building steel (if present) to the electrical ground.

6) TMGB/PBB, TGB/SBB to Equipment Racks

f) Per the TIA-607-D, the maximum value for resistance between any point in the telecommunications bonding and grounding system and the building’s electrical grounding electrode system is 100 milliohms. In the case of long TBB and Grounding Equalizer conductor runs, the resistance of the conductor must be factored into the total resistance. For example, 1 km of a No. 3/0 conductor has a resistance of 0.2028 ohms. (0.06180 ohms per 1000 ft.)

g) The Contractor shall notify the Architect/Design Consultant a minimum of five (5) days in advance to observe field testing.

3.6 PROJECT CLOSEOUT DOCUMENTATION

A. As-Built Drawings

1. Drawings shall be provided to the Architect/Design Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Architect/Design Consultant.

2. Three (3) sets of drawings depicting the condition of the structured cabling system as installed.

3. As-Built drawings shall be produced in AutoCAD 2013 or higher and provided in hardcopy and electronically in .dwg and PDF format. Provide (1) laminated copy ARCH C (18” X 24”) in each MDF/IDF.

4. Hardcopy drawings shall be provided in the original size as issued by the Architect/Design Consultant.

5. Drawings shall retain the formatting and title block of the original drawings as issued by the Architect/Design Consultant.

6. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of all equipment room/telecommunication room layouts, wall elevations, equipment rack elevations, ladder racks, cable tray, sleeves, backbone, and horizontal cable pathways, workstation locations, and labeling scheme.

B. Test Documentation

1. Test documentation shall be provided to the Architect/Design Consultant at the time of substantial completion. Final payment will not be recommended until these test results are received and approved by the Architect/Design Consultant.

2. Three (3) sets of test documentation for the structured cabling system as installed.

3. Test results shall be provided in hard copy and electronic format (i.e., manufacturer's proprietary testing software along with applicable reader software) and PDF electronic format.

4. Test documentation shall be bound, sectioned, and tabbed in the following sequence as applicable:

   a) Tester(s) Calibration Certificate(s)

   b) Inter-Building Backbone Fiber Optic Cable

   c) Intra-Building Backbone Fiber Optic Cable

   d) Intra-Building Backbone Count Copper

   e) Horizontal Category 5e Cable

   f) Horizontal Category 6 Cable

   g) Horizontal Category 6A Cable

   h) Main Building Ground

   i) Two-Point Ground/Continuity Test

C. Manufacturer's Performance Certification

1. Certificate shall be provided to the Architect/Design Consultant at the time of final system acceptance. Final payment will not be recommended until the certificate of certification is received and approved by the Architect/Design Consultant.

   a) The manufacturer of the solution shall furnish a performance certification as per the specifications starting at final system acceptance.

   b) One original and two copies of the Manufacturer's Certificate shall be provided.

D. Manufacturer's Product Warranty

1. Certificate of product warranty shall be provided to the Architect/Design Consultant at the time of final system acceptance. Final payment will not be recommended until this certificate of product warranty is received and approved by the Architect/Design Consultant.

   a) The manufacturer of the solution shall furnish a product warranty as per the specifications starting at final system acceptance.

   b) One original and two copies of the Manufacturer's product warranty shall be provided.

E. Contactor's Statement of Warranty

1. Statement of warranty shall be provided to the Architect/Design Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Architect/Design Consultant.

   a) Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor, and workmanship starting at final system acceptance.

   b) One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e., Contractor name, Point of Contact, address, phone number, and email address) and start and end date for warranty call outs.

END OF SECTION

SECTION 27 41 16 – INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY
- A. Integrated Audio-Video Systems and Equipment as part of the Work.

1.2 RELATED DOCUMENTS
- A. General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this section.
- B. Reference the Project Manual for related specification sections.
- C. Reference the Project Drawings for additional information.

1.3 SECTION INCLUDES
- A. Project instructions for the Contractor and System description details
- B. System product description
- C. Project completion instructions for the Contractor

1.4 RESPONSIBILITY
- A. Responsibilities include, but are not limited to, the following items:
  1. Provide materials, equipment, transportation, and labor necessary for a fully working, tested, and calibrated system. Supply accessories and minor equipment items (such as, but not limited to, power strips, adapters, connectors, mounting hardware, etc.) needed for a complete system, even if not specifically mentioned in these Specifications. Notify the Architect of any discrepancies in part numbers or quantities before bid. Failing to provide such notification, supply items and quantities according to the intent of the Specification and Drawings, without claim for additional payment.
  2. Specifications and drawings are complementary. Work called for by one is binding as if called for by both. Any discrepancies between specifications and drawings shall be brought to the attention of the Architect for clarification during the bidding period. No allowance shall subsequently be made to the Contractor by reason of their failure to have brought said discrepancies to the attention of the Architect.
  3. Execute work in accordance with the National Electrical Code (NEC), the National Electrical Safety Code, the Occupational Safety and Health Act (OSHA), applicable State and Local codes, ordinances, regulations, authority having jurisdiction (AHJ), and manufacturer's recommendations. If a conflict develops between the contract documents and the appropriate codes and is reported to the Architect prior to bid opening, the Architect will prepare the necessary clarification. Where a conflict is reported after contract award, propose a resolution of the conflict and, upon approval, perform Work.
  4. Required licenses, insurance and permits including payment of charges and fees
  5. Verification of dimensions and conditions at the job site.
  6. Coordinate location and installation of equipment with other building elements.
  7. Preparation of submittal information
  8. Pick-up of Owner Furnished Equipment (OFE) and incorporation into project if applicable.
  9. Development and implementation of control system software code and control panel layouts, which will become the property of the Owner
  10. Final tests and adjustments, written report, and documentation
  11. Instruction of operating personnel
  12. Provision of manuals
  13. Maintenance services and warranty.

1.5 REFERENCES
- A. Published specification standards, tests or recommended methods of trade, industry or governmental organizations apply to Work in this section where cited below:
  1. American National Safety Institute (ANSI)
  2. American Society of Testing and Materials (ASTM)
  3. Electronics Industries Association (EIA)
  4. Federal Communications Commission (FCC)
  5. National Electrical Manufacturer's Association (NEMA)
  6. National Electrical Code (NEC)
  7. Underwriters Laboratories (UL)

8. Occupational Safety and Health Administration (OSHA)
9. Society of Motion Picture and Television Engineers (SMPTE)
10. Building Industry Consulting Service International (BICSI)
11. Davis and Davis, Sound System Engineering (3rd Edition) (SSE), Howard W. Sams, 2006
12. Giddings, Audio System Design and Installation (ASDI), Howard W. Sams, 2013
13. AV Installation Handbook Second Edition: The Best Practices for Quality Audiovisual Systems, Infocomm (AVIH), 2009

1.6 DEFINITIONS

A. In addition to those Definitions of Division1, the following list of terms as used in this specification shall be defined as follows:
   1. Furnish - To purchase, procure, acquire, and deliver complete with related accessories.
   2. Install – To set in place, join, attach, link, set up or otherwise connect together and test until complete before turning over to the Owner, all parts, items, or equipment supplied by Contractor.
   3. Provide – To furnish and install.

1.7 DESCRIPTIONS & REQUIREMENTS

A. The following is intended to further describe the Work and clarify design intent and is not an exhaustive description of the systems.
B. Auditorium
   1. Existing System
      a. Remove existing audio visual system whenever necessary.
      b. Palletize and turn over to Owner any and all removed equipment.
      c. Existing sound system to be reinstalled in same manner and condition, with the exception of items being replaced in this scope.
   2. Mixing System
      a. Provide a digital mixing system at the main control position for productions.
   3. Audio Sources
      a. Provide wireless microphone system installed in the front-of-house position.
   4. AV Presentation System
      a. Provide a motorized projection screen
      b. Provide a laser projector
      c. Provide a video switch and digital video transport for video paths
      d. Provide HDMI input at the Stage Manager’s Rack
      e. Provide Wireless Presentation System at Stage Manager Rack
      f. Provide Touch Panel Control System at Stage Manager’s Rack
      g. Control of the AV presentation system shall be simple and intuitive via touch panel. Provide the following controls
         1) Projector power on and off functions with state feedback from projector
         2) Video switch source selection with state feedback of video switch
         3) Projection screen raise, lower and stop
   5. Life Safety
      a. Provide a contact closure from the life safety system.
      b. System to mute upon contact closure and remain muted during the alarm.
      c. System to continue previous operation when alarm has ended.
C. Black Box
   1. Audio Sources
      a. Provide a wireless microphone system.
      b. Provide a rack mounted multi-media player for music playback.
      c. Provide wired and wireless media connectivity.
      d. Provide cabling and equipment accessories.
   2. Mixing System
      a. Provide a rack mounted digital mixer.
   3. Processing and Amplification
      a. Provide DSP amplification for room loudspeakers.
   4. Loudspeakers
      a. Provide loudspeakers with pipe-clamps for mounting to the pipe grid.
      b. Provide cabling connections around the room for loudspeaker connections at the pipe grid and portable equipment rack at the floor.
   5. Equipment Housing
      a. Provide a portable equipment rack for housing mixer, amplifier, and playback equipment.
   6. Production Intercom

a. Provide a wireless intercom system.
b. Provide wireless belt packs and headsets.
c. System to be housed in separate portable equipment rack.

7. Hearing Assist
   a. Provide a wireless, single channel radio frequency hearing assist system.
   b. System must operate on approved FCC frequencies.
   c. Provide enough portable receivers to meet current ADA standards including:
      1) Ear speakers
      2) Headsets
      3) Inductive coil loops

D. Theater Classroom
1. Audio Sources
   a. Provide a rack mounted multi-media player for music playback.
2. Mixing System
   a. Provide a rack mounted mixer.
3. Loudspeakers
   a. Provide wall mounted speakers at the front of the room.
4. Equipment Housing
   a. Provide a portable equipment rack for housing of rack mounted equipment.
5. Life Safety
   a. Provide a contact closure from the life safety system.
   b. System to mute upon contact closure and remain muted during the alarm.
   c. System to continue previous operation when alarm has ended.

E. Band/Orchestra/Mariachi
1. Audio Sources
   a. Provide microphones for recording.
   b. Provide a rack mounted multi-media recorder.
   c. Provide wired and wireless media connectivity.
   d. Provide cabling and equipment accessories.
2. Mixing System
   a. Provide a rack mounted mixer for control and routing of audio sources.
3. Processing and Amplification
   a. Provide DSP amplification for room loudspeakers.
4. Loudspeakers
   a. Provide wall mounted speakers at the front of the room for music playback.
   b. Provide floor mounted subwoofer.
5. Presentation System
   a. Provide a fixed wall-mounted projection screen for Band/Orchestra
   b. Provide a motorized projection screen for Mariachi
   c. Provide a wall-mounted projector.
   d. Provide wired HDMI input with audio at wall plate at teacher workstation
   e. Provide balanced wired audio connection to audio system
   f. Provide button panel style control system with rotary volume control
6. Equipment Housing
   a. Provide a portable equipment rack for housing of rack mounted equipment.
7. Life Safety
   a. Provide a contact closure from the life safety system.
   b. System to mute upon contact closure and remain muted during the alarm.
   c. System to continue previous operation when alarm has ended.

F. Choir
1. Audio Sources
   a. Provide wireless microphone system.
   b. Provide microphones for recording.
   c. Provide a rack mounted multi-media recorder.
   d. Provide wired and wireless media connectivity.
   e. Provide cabling and equipment accessories.
2. Mixing System
   a. Provide a rack mounted mixer for control and routing of audio sources.
3. Processing and Amplification
   a. Provide DSP amplification for room loudspeakers.
4. Loudspeakers
   a. Provide wall mounted speakers at the front of the room for music playback.

b. Provide floor mounted subwoofer.

5. Presentation System
   a. Provide a wall-mounted projection screen.
   b. Provide a wall-mounted projector.
   c. Provide wired HDMI input with audio at wall plate at teacher workstation
   d. Provide balanced wired audio connection to audio system
   e. Provide button panel style control system with rotary volume control
6. Equipment Housing
   a. Provide a permanent wall mounted equipment rack for housing of rack mounted equipment.
   b. Equipment rack to be located near the director for quick access to operable equipment.
7. Life Safety
   a. Provide a contact closure from the life safety system.
   b. System to mute upon contact closure and remain muted during the alarm.
   c. System to continue previous operation when alarm has ended.

G. Ensemble/Shared Ensemble/Percussion
1. Audio Sources
   a. Provide a rack mounted multi-media player for music playback.
   b. Provide wired and wireless media connectivity.
   c. Provide a line input connection at the front of the room for Owner provided metronome.
   d. Provide cabling and equipment accessories.
2. Mixing System
   a. Provide a rack mounted mixer for control and routing of audio sources.
3. Processing and Amplification
   a. Provide DSP amplification for room loudspeakers.
4. Loudspeakers
   a. Provide wall mounted speakers at the front of the room for music playback.
5. Presentation System
   a. Provide a wall-mounted projection screen.
   b. Provide a wall-mounted projector.
   c. Provide wired HDMI input with audio at wall plate at teacher workstation
   d. Provide balanced wired audio connection to audio system
   e. Provide button panel style control system with rotary volume control
6. Equipment Housing
   a. Provide a portable equipment rack for housing of rack mounted equipment.
7. Life Safety
   a. Provide a contact closure from the life safety system.
   b. System to mute upon contact closure and remain muted during the alarm.
   c. System to continue previous operation when alarm has ended.

H. Aux Gym
1. Existing System
   a. Remove existing audio visual system.
   b. Palletize and turn over to Owner any and all removed equipment.
2. Audio Sources
   a. Provide wired microphone connections at either end of the court.
   b. Provide line input connections located in wall plates on either side of the court.
   c. Provide wireless microphone system.
   d. Provide dynamic microphones.
   e. Provide wired and wireless media connectivity.
   f. Provide cabling and equipment accessories.
3. Processing and Amplification
   a. Provide a dedicated DSP to the space.
   b. Provide DSP amplification for room loudspeakers.
4. Loudspeakers
   a. Provide surface mounted loudspeakers distributed over seating area for audio coverage of the spectator seats.
   b. Provide surface mounted loudspeakers distributed over the court for audio coverage of the court.
5. Equipment Housing
   a. Provide a permanent wall mounted equipment rack for housing of rack mounted equipment.
   b. Equipment rack to be located in adjacent storage room.
6. Control
   a. Provide a touch panel control system for system operation.

b. Touch panel to be located behind a protective hinged door.

7. Hearing Assist
   a. Provide a wireless, single channel radio frequency hearing assist system. System must operate on approved FCC frequencies.
   b. Provide a remote mounted antenna to provide coverage of the audience area.
   c. System must operate on approved FCC frequencies.
   d. Provide enough portable receivers to meet current ADA standards including:
      1) Ear speakers
      2) Headsets
      3) Inductive coil loops
8. Life Safety
   a. Provide a contact closure from the life safety system.
   b. System to mute upon contact closure and remain muted during the alarm.
   c. System to continue previous operation when alarm has ended.

1.8 SUBMITTALS

A. Provide submittals in accordance with Conditions of the Contract and Division 1, Submittal Procedures section unless otherwise indicated.

B. Submittals shall contain sufficient information to describe the Work to be performed. Reviewed shop drawings are to be used for final coordination and construction.

C. Shop drawings must be original work produced by the Contractor responsible for performing the work defined in this specification. Scanning, photographic copying, materially copying, or any other reproducing the contents of the drawings or specifications contained within the Contract Documents will be marked as unacceptable and not reviewed for any content. No claim shall be made for delay, undue burden, or additional costs for the effort to produce shop drawings, schedules, and equipment lists addressing this specification or the overall project manual.

D. Supplementary submittal requirements:
   1. Provide the following in one electronic submission for review within thirty days of issuance of Notice to Proceed (NTP) and prior to commencement of Work:
      a. Complete schedule of submittals.
      b. Chronological schedule of Work in bar chart form.
      c. Product Data Sheets:
         1) Provide a complete table of contents with the following information:
         2) Project title.
         3) Submittal number. In the case of a resubmittal, use the original submittal number immediately followed by the suffix “R” immediately followed by a unique number and be numbered in consecutive order.
         4) Date of submission.
         5) Provide a list of and Manufacturer's data sheets on products to be incorporated with the Work. Arrange data sheets in the same order they appear in this specification. Where a data sheet shows more than one product, indicate the model being proposed with an arrow or other appropriate symbol.
         6) Submit manufacturer’s product literature for each type of firestop material to be used. Literature shall include documentation of UL classifications or approved third party testing. Manufacturer’s name and number for each part shall be included. Submit drawings of through penetrations, which include the system to be utilized for the firestopping application. Drawing shall indicate construction of wall or floor assembly; size, number and material of penetrating items; firestop system designation; required F-rating, T-rating and remarks.
         7) Upon Owners and/or Consultant’s request provide (3) three copies of the submittals. Bind submittal in titled three ring D style binders sized for 150 per cent of the material. Maximum size: three-inch spine. Use multiple volumes as required. Separate major grouping with labeled binder tabs.
         8) Submissions that do not follow the format and configuration described above will be returned without review.
      d. Shop Drawings:
         1) Functional Diagrams/Schematics:
            a) Detailed wiring diagrams showing interconnection of components and products, wiring and cabling diagrams depicting cable types and designators, and device designators for each system. Provide connector designations and terminal strip identification, along with color codes for cables connecting to

these devices. Give each component a unique designator and use this designator consistently throughout the project.

2) Coordination Drawings:
   a) Prepare and submit a set of coordination drawings showing major elements, components, and devices of the audio and video system in relationship with other building components. Prepare drawings to an accurate scale of 1/8”=1’-0” or larger on suitable sized media.
   b) Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively coordinate and integrate all equipment. Indicate locations where space is limited, and where sequencing and coordination of installations is of importance to the efficient flow of the Work including but not necessarily limited to the following:
      (1) Equipment housings
      (2) Ceiling and wall mounted devices
      (3) Raceways
      (4) Cabling

e. Equipment: Location of equipment within racks, consoles, or on tables, with dimensions; wire routing and cabling within housings; AC power outlet and terminal strip locations.
f. Patch panel(s): Layouts and designation (labeling) strips, including color schemes.
g. Full fabrication details of any custom enclosures and millwork indicating size, material, finish and openings for equipment.
h. Structural rigging and mounting details:
   1) Loudspeaker rigging, suspension, and mounting detail drawings shall be signed and sealed by a professional engineer licensed to practice in the state in which the project is located. The signed and sealed drawings noted above to include the following:
      a) Analysis of all components in the load path and attachment method to building structure for suspended loudspeakers.
      b) Attachment method for mounting brackets at ceilings, walls, or other building features.
      c) Detail the product manufacturer, part numbers, and load capacity of the hardware fittings and materials selected for suspended or mounted loudspeakers.
      d) A copy of the design calculations.
      e) Secondary steel required for attachment to the building structure.
      f) Custom brackets, mounts, suspension grids or trusses, loudspeaker cabinet frames, or loudspeaker brackets.
      g) Loudspeaker brackets or mounts provided by the specific loudspeaker manufacturer being installed that do not include traceability data.
   2) Traceability data and/or ANSI standard compliance data for loudspeaker mounting brackets or rigging provided by the loudspeaker manufacturer.
   3) Risk analysis data as referenced in Part 3.2, F
   4) Stamping Engineer post-installation sign-off as described in Part 3.2, F
   5) Proof of ETCP certification for on-site rigging crew.
i. Projector, loudspeaker, camera mounting details, include hardware types and load capacity.
j. Fabricated Plates and Panels
   1) Provide complete drawings on custom fabricated plates or panels. Drawings shall include dimensioned locations of components, component types, engraving information, plate material and color, and bill of material.
k. Labeling
   1) Equipment and cabling labeling scheme. Include font sizes and styles, explanation of scheme, and designator schedule.
l. Schedules
   1) Wiring schedule showing source and destination of wiring and indicating which wiring is in conduit. Junction box schedule showing type of box, size, mounting and location. Include this information with remainder of wiring diagrams.
m. Control System Software
   1) Provide electronic copies of proposed control system user interfaces within sixty (60) days of issuance of Notice to Proceed (NTP).
n. IP Addresses
   1) Coordinated with the venue IT Administrator, provide a list of IP addresses, by device, used in the project.

o. Consultant's project documents in electronic format will not be supplied to the Contractor for their use as part of submittals.
p. Detail drawings executed at an appropriate scale, but not smaller than 1/8 inch = 1'–0".
q. Submissions that do not follow the format and configuration described above will be returned without review.
r. Any other pertinent data which is necessary to provide the Work.

2. Control System Software:
a. Provide electronic copies of proposed control system user interfaces within sixty (60) days of issuance of Notice to Proceed (NTP).

E. Resubmission requirements:
1. Make all requested corrections or change in submittals required. Resubmit for review until no exceptions are taken.
2. Indicate all changes that have been made other than those requested.

1.9 CONTRACT CLOSE-OUT DOCUMENTS:
A. Provide submittals in accordance with Conditions of the Contract and Division 1, Submittal Procedures section unless otherwise indicated, after substantial completion but prior to final observation:
B. Supplementary submittal requirements:
1. Provide the following in one electronic submission for review.
a. Equipment Manuals:
1) Manufacturer's owner/instruction manual for each type of Product by manufacturer and model or part number unless specified otherwise herein
2) Supply manufacturer's serial numbers for each Product
3) For custom circuits or modifications, a description of the purpose, capabilities, and operation of each item
4) Separately bind list by manufacturer and model or part number of Products incorporated within the Work, arranged in alpha numeric order. When applicable, bind Manufacturer's warranty statements separately.
b. Test Reports: Recorded findings of Commissioning.
c. Signed copy of turn over equipment to Owner including quantity, make and model.
d. Copy of any program or hardware setup files.
e. System Operation and Instructions: Prepare a complete and typical procedure for the operation of the equipment as a system, organized by subsystem or activity.
1) This procedure should describe the operation of system capabilities.
2) Assume the intended reader of the manual to be technically inexperienced but unfamiliar with the components and the facility.
f. Provide Consultant with copy of Owner training video.
g. Service Information, including service phone number(s) and hours; service schedule; description of products recommended or provided for maintenance purposes, and instructions for the proper use of these products.
h. Any other pertinent data generated during the Project or required for future service.
i. Within three (3) weeks of final observation, submit the following in one electronic submission for review. Upon Owners and/or Consultant's request provide (3) three copies of the following:
1) Record drawings: Final rendition of Shop Drawings depicting what is actually incorporated within the Work.
2) Hardcopy full size set of Record drawings.
3) Three (3) compact disc or DVD's containing Record drawings in AutoCAD editable DWG format and Adobe PDF format. Resolution to be sufficient to permit Owner's technicians to be able to clearly read all notes and text on screen.
4) One set of signed proof-of-training documents.

2. Submittal Format:
a. Record Drawings: Drawings executed at an appropriate scale, but not smaller than 1/8 inch = 1'–0".
b. Segregate documents into separate binders containing data relevant to operational, maintenance, and warranty issues. Appropriately duplicate data within the separate bindings when it will reasonably clarify procedures, e.g., operational data in maintenance binding.
c. Bind Project Record Manual in titled three ring D style binders sized for 150 per cent of the material. Maximum size: three inch spine. Use multiple volumes as required. Separate major grouping with labeled binder tabs.

C. Resubmission requirements:

1. Make all requested corrections or change in submittals required. Resubmit for review until no exceptions are taken.
2. Indicate all changes that have been made other than those requested.

1.10 CUSTOM SOFTWARE

A. Introduction:
1. Proprietary software provided for the Technical Systems shall be subject to this software license between the Contractor and the Owner as an essential element of the system as defined in the system specification and associated documents, drawings and agreement.
2. Contractor shall agree that 3rd party proprietary software provided with the system shall be subject to this agreement.
3. Contractor and Owner agree that this software license is deemed to be part of, and subject to, the terms of the Agreement applicable to both parties; and shall supersede any standard manufacturer or Contractor's standard license agreement.
4. Proprietary software shall be defined to include, but not be limited to, device and system specific software and firmware designed to run on conventional computer based operating platforms as well as all micro-processor based hardware used to program, setup, or operate the system or its components.
5. For sake of this agreement, MS Windows® shall not be considered "proprietary" software, unless a non-public version of Windows® or any of its components are critical to the operation of the system in which case it shall be deemed proprietary.

B. License Grant and Ownership:
1. Contractor hereby grants to Owner a perpetual, non-exclusive, site license to all software for Customer's use in connection with the establishment, use, maintenance and modification of the system implemented by Contractor. Software shall mean executable object code of software programs and the patches, scripts, modifications, enhancements, designs, concepts or other materials that constitute the software programs necessary for the proper function and operation of the system as delivered by the Contractor and accepted by the Owner.
2. Except as expressly set forth in this agreement, Contractor shall at all times own all intellectual property rights in the software. Any and all licenses, product warranties or service contracts provided by third parties in connection with any software, hardware or other software or services provided in the system shall be delivered to Owner for the sole benefit of Owner.
3. Owner may supply to Contractor or allow the Contractor to use certain proprietary information, including service marks, logos, graphics, software, documents and business information and plans that have been authored or pre-owned by Contractor. All such intellectual property shall remain the exclusive property of Owner and shall not be used by Contractor for any purposes other than those associated with delivery of the system.

C. Copies, Modifications, and Use:
1. Source code shall be available to Owner for a period of not less than 10 years.
2. Owner may make copies of the software for archival purposes and as required for modifications to the system. All copies and distribution of the software shall remain within the direct control of Owner and its representatives.
3. Owner may make modifications to the source code version of the software, if and only if the results of all such modifications are applied solely to the system. In no way does this Software License confer any right for Owner to license, sublicense, sell, or otherwise authorize the use of the software, whether in executable form, source code or otherwise, by any third parties.
4. All express or implied warranties relating to the software shall be deemed null and void in case of any modification to the software made by any party other than Contractor.

D. Warranties and Representations:
1. Contractor represents and warrants to Owner that:
   a. It has all necessary rights and authority to execute and deliver this Software License and perform its obligations hereunder and to grant the rights granted under this Software License to Owner;
   b. The goods and services provided by contractor under this Software License, including the software and all intellectual property provided hereunder, are original to Contractor or its subcontractors or partners; and
   c. The software, as delivered as part of the system, will not infringe or otherwise violate the rights of any third party, or violate any applicable law, rule or regulation.
2. Contractor further represents and warrants that, throughout the System Warranty Period, the executable object code of software and the system will perform substantially in accordance with the System Specifications and Agreement. If the software fails to perform as specified and accepted all remedies are pursuant to the policies set forth in the Specification and in the Agreement. No

warranty of any type or nature is provided for the source code version of the software which is delivered as is.

3. Except as expressly stated in this Agreement, there are no warranties, express or implied, including, but not limited to, the implied warranties of fitness for a particular purpose, of merchantability, or warranty of no infringement of third party intellectual property rights.

1.11 QUALITY ASSURANCE

A. Qualifications: Contractor to be experienced in the provision of systems similar in complexity to those required for this project, and meet the requirements listed below. Provide documentation at the time of bid to support these qualifications:
   1. Form of corporation.
   2. No less than three years' experience with equipment and systems of the specified types.
   3. Experience with at least three comparable scale projects within the last three years.
   4. Be a franchised dealer and service facility for the manufacturer's products furnished.
   5. Maintain a fully staffed and equipped service facility with full-time field technicians.
   6. Have at least one supervisory on-site employee who has completed and has been certified CTS-I by Infocomm.
   7. Supervision of all rigging by an ETCP certified rigger for all work associated with suspension or mounting of overhead equipment.
   8. Adequate plant capacity and equipment to complete the Work.
   9. Adequate staff with commensurate technical experience.
   10. Suitable financial status (i.e., bonding and materials purchase capacity) to meet the obligations of the Work.
   11. Adequate regional service organization to meet warranty response requirements of the Project.
   12. Provide listing with appropriate explanation regarding the status of Contractor's resolved or unresolved legal disputes within the last six calendar years.
   13. Provide listing with appropriate explanation regarding any projects within the last 3 years where the Contractor has failed to meet construction schedules due to Contractor's cause.
   14. Completed current version of the AIA Contractor's Qualification Form.
B. Subcontractors: at the time of bid, the Contractor shall provide a list of structural, electrical, sound, or any other subcontractors intended to do the Work, or are being retained as local service providers throughout the warranty period. Subcontractors shall be appropriately state licensed in their specialty and must provide the same qualification documents as the Contractor.
C. Work: Perform Work in compliance with the applicable standards listed herein and governing codes and regulations of the authorities having jurisdiction and the Contract Documents.
   1. Drawings and specification requirements govern where they exceed Code and Regulation requirements.
   2. Where requirements between governing Codes and Regulations vary, the more restrictive provision applies.
   3. Nothing in the Contract Documents grants authority or permission to disregard or violate any legal requirements.
D. Coordinate exact location and installation of equipment, power, grounding, and raceway requirements with the Architect.

1.12 DELIVERY, STORAGE & HANDLING

A. Ship Products in its original container, to prevent damaging or entrance of foreign matter.
B. Handling and shipping in accordance with Manufacturer's recommendation.
C. Provide protective covering during construction of all installed devices, to prevent damaging or entrance of foreign matter.
D. Replace at no expense to Owner, Products damaged during storage, handling or the course of construction.

1.13 PROJECT CONDITIONS

A. Verify conditions on the job site applicable to this work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.
B. The Drawings diagrammatically show cabling and arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install work as shown, recommend solutions and/or submit drawings to Architect for approval, showing how the work may be installed.

1.14 WARRANTY

A. Warrant labor and equipment for one year following the date of substantial completion to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics. Repair or replace defects occurring in labor or equipment within the Warranty period without charge.
B. This warranty is in addition to any specific warranties issued by manufacturers for greater periods of time.
C. Within the warranty period, answer service calls within twenty four (24) hours during normal working hours and correct the deficiency within forty eight (48) hours.
D. Provide Owner with the name and telephone number of the person to call for service. This information to be part of Project Closeout Documents.
E. Thirty days prior to the end of the warranty period provide a complete checkout of all system components. Repair or replace any defective equipment discovered during the testing. Correct any defects in wiring or other functional problems reported by Owner. Warranty replacement and service of equipment shall not apply to Owner furnished equipment (OFE). Coordinate observation visit with the Owner.

PART 2 - PRODUCTS

2.1 GENERAL
A. Products quantity is as required. If a quantity is given, provide at least the given amount. Some product listed may not be required to fulfill the obligations of the Work.
B. Equipment and materials shall be new and conform to applicable UL or ANSI provisions.
C. Regardless of the length or completeness of the descriptive paragraph herein, provide Products complying with the specified manufacturer's published specifications.
D. Remove or blank out all manufacturers’ names, logos, or other symbols from loudspeakers or other objects placed in view of the public. If logos are removable, remove and repaint to the color of the adjacent surface and reattach.
E. Take care during installation to prevent scratches, dents, chips, etc.

2.2 ACCEPTABLE MANUFACTURERS
A. Model numbers and manufacturers included in this specification are listed as a standard of function, performance, and quality.
B. Refer to General and Supplementary Conditions and Division 1 Specification Sections for equipment substitution procedure.
C. If a specified product has been discontinued by a manufacturer, provide the replacement model (as certified by the manufacturer) at no additional cost.
D. Where required provide manufacturer’s rack mount adapter or one manufactured by Middle Atlantic or Winstead unless specified elsewhere.

2.3 MICROPHONES AND ACCESSORIES
A. Single Wireless Microphone System (WLRS, Type 1)
1. Not specified.
B. Dual Wireless Microphone System (WRLS, Type 2)
1. Receiver Type: Digital Wireless System with automatic switching diversity reception with XLR type audio output connectors.
2. Indicators: LED signal strength meters for battery, RF and audio levels.
3. Frequency: Coordinate with FCC and local requirements.
4. Antennas: Rear mount passive antennas for the frequency spectrum chosen.
5. 1-RU Rack mountable.
6. Acceptable Product:
a. Shure ULXD4D Diversity Receiver
C. Triple Wireless Microphone System (WRLS, Type 3)
1. Not specified
D. Quad Wireless Microphone System (WRLS, Type 4)
1. Receiver Type: Digital Wireless System with automatic switching diversity reception with XLR type audio output connectors.
2. Indicators: LED signal strength meters for battery, RF and audio levels.
3. Frequency: Coordinate with FCC and local requirements.
4. Antennas: Rear mount passive antennas for the frequency spectrum chosen.
5. 1-RU Rack mountable.
6. Acceptable Product:
a. Shure ULXD4Q Diversity Receiver
E. Multi-Channel Wireless Microphone System (WRLS, Type 5)

1. Receiver Type: Digital Wireless System with automatic switching diversity/quadversity reception with XLR type audio output connectors.
2. Indicators: LED signal strength meters for battery, RF and audio levels.
3. Frequency: Coordinate with FCC and local requirements.
4. Antennas: Rear mount passive antennas for the frequency spectrum chosen.
5. 1-RU Rack mountable.
6. Provide channel licensing for number of channels as shown in drawings.
7. Acceptable Product:
    a. Shure ANX4

F. Wireless Antenna (ANT-MA)
1. Directional antenna
2. Wide band
3. Provide any additional signal amplification recommended by manufacturer
4. Provide any additional mounting hardware as required
5. Acceptable Product:
    a. Shure UA874US
        1) Shure UA834 (as needed)
        2) Atlas MAC-1 (Coordinate finish with Architect)
        3) Atlas AD19# (Coordinate finish with Architect)

G. Bodypack Wireless Microphone (Type 1)
1. Theatrical headset/lapel mic
2. Acceptable Product:
    a. Shure ULXD1 Bodypack Transmitter
        1) Shure SB900B Lithium Ion Battery
        2) Shure UL4#-MTQG Headset Microphone (coordinate color with Owner)
        3) Shure MX153#/O-TQG (coordinate color with Owner)

H. Bodypack Wireless Microphone (Type 2)
1. Athletic headset/lapel mic
2. Acceptable Product:
    a. Shure ULXD1 Bodypack Transmitter
        1) Shure SB900B Lithium Ion Battery
        2) Shure UL4#-MTQG Headset Microphone (coordinate color with Owner)
        3) Shure SM31FH

I. Handheld Wireless Microphone (Type 1)
1. Beta 87A capsule
2. Acceptable Product:
    a. Shure ULXD2/B87A Handheld Transmitter
        1) Shure SB900B Lithium Ion Battery

J. Wireless Microphone Charge Base (Type 1)
1. 8 Port Wireless Microphone Charging Dock
2. Acceptable Product:
    a. Shure SBC800-US Battery Charger Base

K. Vocal Microphone: (Type 1)
1. Handheld dynamic cardioid pattern
2. Acceptable Product:
    a. Audix OM6
    b. Shure Beta58a
    c. Approved Equivalent

L. Instrument Microphone: (Type 1)
1. Dynamic cardioid pattern
2. Acceptable Product:
    a. Audix D4
    b. Shure Beta57a
    c. Approved Equivalent

M. Instrument Microphone: (Type 2)
1. Condenser cardioid pickup pattern
2. Acceptable Product:
    a. Audix f9
    b. Shure SM81
    c. Approved Equivalent

N. Suspended Microphone: (Type 1)
1. Phantom powered

2. Acceptable Product:
   a. Audix ADX40 with CPSADXC cardioid capsule
   b. Shure MX202B/C
   c. Approved Equivalent

O. Microphone Switch (MIC SWITCH, Type 1)
1. Push to talk
2. Tabletop
3. Acceptable Product:
   a. ProCo SAS2
   b. Approved Equivalent

2.4 INPUT SOURCES

A. Media Player (MDP, Type 1):
1. Analog and outputs: RCA unbalanced.
2. 1-U Rack Mountable.
3. Bluetooth Receiver
4. USB & Aux input
5. Wireless Remote Control.
6. Acceptable Product:
   a. Tascam CD-400U

B. Media Recorder (MDR, Type 1):
1. Analog inputs and outputs: RCA unbalanced, Balanced XLR
2. Digital input and output: S/PDIF, AES/EBU
3. Media Format: SD, USB, CD
4. File Formats: CD, MP3, WAV
5. Stereo Record and Playback
6. Ethernet connectivity
7. 1-U Rack Mountable.
8. Wireless remote control
9. Acceptable Product:
   a. Tascam SS-CDR250N

C. Mono DI Box (Type 1):
1. Inputs for unbalanced line sources
2. Inputs shall be via ¼” receptacles
3. Line and mic level outputs
4. Ground lift switch
5. Acceptable Product:
   a. Whirlwind DIRECTOR
   b. Radial ProDI
   c. Approved Equivalent

D. Stereo DI Box (Type 1):
1. Inputs for stereo/dual mono unbalanced line sources
2. Inputs shall be via ¼”, RCA, 3.5mm receptacles
3. Line and mic level outputs
4. Ground lift switch
5. Acceptable Product:
   a. Whirlwind DIRECT2
   b. Radial ProAV2
   c. Approved Equivalent

E. Stereo Computer DI Box (Type 1):
1. Inputs for stereo/dual mono unbalanced line sources
2. Inputs shall be via ¼”, RCA, 3.5mm receptacles
3. Line and mic level outputs
4. Ground lift switch
5. Acceptable Product:
   a. Whirlwind PC-DI
      1) ProCo BPMBMB-3 3.5mm TRS Cable
   b. Radial JPC
      1) ProCo BPMBMB-3 3.5mm TRS Cable
   c. Approved Equivalent

F. Stereo Computer USB DI Box (Type 1)
1. Inputs shall be via USB receptacle

2. Mic level outputs
3. Acceptable Product:
4. Whirlwind PC-USB
    a. Radial USB-Pro
    b. Approved Equivalent

G. Line Input (LI, Type 1)
1. Decora mounted
2. Stereo RCA jacks
3. Stereo 3.5mm jack
4. Balanced stereo outputs
5. Acceptable Product:
    a. RDL DS-CIJ3D

H. Bluetooth Receiver (BTRX, BTIO, Type 1)
1. Input: Bluetooth
2. Output: balanced analog audio.
3. Provides long distance distribution of Bluetooth audio using Cat6 cable.
4. Powered from receiver in rack.
5. Does not support automatically pairing.
6. Customizable Bluetooth name.
7. Coordinate finish with Architect
8. Acceptable Product to Include:
    a. RDL BT1A (BTRX)
    b. RDL TX-TPR2A (BTIO)

I. Bluetooth Receiver (BTRX, Type 2)
1. Input: Bluetooth & Line level
2. Output: Dante
3. Provides long distance distribution of Bluetooth audio using Cat6 cable.
4. Powered from receiver in rack.
5. Does not support automatically pairing.
6. Customizable Bluetooth name.
7. Coordinate finish with Architect
8. Acceptable Product:
    a. Q-Sys unD6IO-BT

2.5 MIXERS

A. Reinforcement Console (MIXER, Type 1):
1. Digital audio mixing surface
2. Customizable motorized faders
3. Touch screen LCD
4. Local Analog and Digital IO
5. Digital Audio Network compatibility
6. Expansion Card Slots
7. Set virtual inputs/output labels to match connector labeling
8. Acceptable Product:
    a. Allen & Heath C3500

B. Stage Rack I/O (MIX IO, Type 1):
1. Analog and Digital I/O
2. 44.1kHz, 48kHz, 88.2kHz, 96kHz sampling
3. Digital Audio Network compatibility
4. Expandable IO
5. Recessed Rack Mounted
6. Acceptable Product:
    a. Allen & Heath CDM series
        1) Allen & Heath Dante 64x64

C. Portable I/O Expander (MIX IO, Type 2)
1. Portable digital audio expander.
2. 16 balanced inputs
3. 8 balanced outputs
4. Acceptable Product:
    a. Allen & Heath DX168

D. Mixer (MIXER, Type 2):
1. 16 input digital rackmount mixer

2. 8 outputs
3. 32 channels
4. USB audio input/output.
5. Rack Mountable.
6. Acceptable Product:
    a. Allen & Heath Qu-5
        1) Allen & Heath Qu-5 rackmount kit

E. Mixer (MIXER, Type 3)
1. 2 mic/5 stereo line inputs with alt. inputs
2. 3 stereo zone outputs
3. Rack Mountable.
4. Acceptable product:
    a. Tascam MZ-223

F. Mixer (MIXER, Type 4):
1. Dante connectivity
2. 16 input digital rackmount mixer
3. 8 outputs
4. 32 channels
5. USB audio input/output.
6. Rack Mountable.
7. Acceptable Product:
    a. Allen & Heath Qu-5D
        1) Allen & Heath Qu-5 rackmount kit

2.6 DIGITAL SIGNAL PROCESSORS

A. Digital Signal Processing System (DSP)
1. Provide independent DSP processing for each system as detailed on the AV drawings.
2. The DSP system and control software shall be operational 30 days prior to the first use of the installed system.
3. Function: Provide all signal processing and control required for the system(s). Devices required include, but are not limited to; mixer, matrix router, crossover, high and low pass filters, delay, compression, 6-band parametric equalizer, limiter, ducker, signal delay, and external control.
4. Unit to be configured with a minimum quantity of inputs and outputs as shown within the AV drawings, including control port requirements.
5. Signal flow and routing to be fully user configurable.
6. Unit to permit hardwire connection of external switches for recalling presets.
7. Unit to permit remote networked control via dedicated devices.
8. Access to external user-adjustable controls shall be restricted.
9. Manufacturer Software:
    a. Provide 12 months of on-site software upgrades from date of final acceptance.
10. DSP Software Setup:
    a. Provide site specific configuration and programming for the DSP software.
    b. Coordinate user interface, software functionality, and menu screens with Architect’s Consultant. Reference submittal requirements.
    c. Provide ongoing software upgrades and maintenance for 12 months from date of final acceptance.
    d. Reference Part 3.4 System Programing in this specification for additional programming details.
11. Where DSP and Amplifiers are used in the same system, use processing and amplification products of the same platform.

B. Digital Signal Processor (DSP, Type 1)
1. Acceptable Product:
    a. QSC Q-Sys Core 110f
        1) QSC QIO-GP8x8 (DSP-GPIO)

C. Digital Signal Processor Input/Output Expander (DSP IO, Type 1)
1. Acceptable Product:
    a. QSC QIO-ML4i
    b. QSC QIO ML2x2
    c. QSC QIO L4o

2.7 POWER AMPLIFIERS

A. General:

1. Two, Four, or Eight channel power amplifier with the EIA standard RS-490 power rating at 1% THD into 70-volt constant voltage load or 8-ohm load as applicable.
2. Provide protection of circuit components in the event of input over-drive, output overload, or short circuits.
3. Frequency response: ±1 dB, 20 Hz to 20 kHz with less than 1 per cent THD at rated output.
4. Input impedance: 10k ohm balanced.
5. Output regulation: 2 dB from no load to full load conditions.
6. Noise generation: at least 85 dB below rated output with input shorted.

B. Acceptable products:
1. Type 1:
   a. LEA CONNECT 35xD
2. Type 2:
   a. QSC CX-Q 4K series
   b. LEA CONNECT 70xD

2.8 LOUDSPEAKERS

A. Speaker (Type 1)
1. Type: Surface mounted loudspeaker
2. Configuration: 12-inch coaxial two-way loudspeaker
3. Frequency Range: 55 Hz – 20 kHz
4. Power: 600W @ 8 ohms
5. Coverage: 90-degree conical
6. Acceptable Product:
   a. Renkus-Heinz CX121M
      1) Renkus-Heinz UBKT/CT121M

B. Speaker (Type 2)
1. Type: Surface mounted loudspeaker
2. Configuration: 12-inch two-way loudspeaker
3. Frequency Range: 60 Hz – 20 kHz
4. Power: 600W @ 8 ohms
5. Coverage: 90 x 40-degree
6. Acceptable Product:
   a. Renkus-Heinz CX121
      1) Renkus-Heinz UBRKT/CT121

C. Speaker (Type 3)
1. Type: Full-range 2-way loudspeaker
2. Configuration: 12-inch driver with 1-inch compression driver
3. Frequency Response: 82Hz – 18kHz
4. Power: 350 @ 8 ohms
5. Coverage: 90 x 60 degrees
6. Acceptable Product:
   a. Electro-Voice EV EKX-12
      1) EKX-TCA pipe clamp/mount bracket
      2) Black Safety Cable

D. Speaker (Type 4)
1. Type: Floor-mounted subwoofer
2. Configuration: 12-inch LF driver
3. Frequency range: 40Hz – 120Hz
4. Power: 300W @ 8 Ohms
5. Acceptable Product:
   a. Renkus-Heinz C112S

E. Speaker (Type 5)
1. Type: High output loudspeaker
2. Configuration: 12-inch two-way
3. Frequency Range: 65 Hz – 20 kHz
4. Power: 600W @ 8 ohms
5. Coverage: 90 x 60 degree
6. Acceptable Product:
   a. ElectroVoice EVF-1122S/96
      1) ElectroVoice EVF-UB
   b. EAW MK2396i
      1) EAW UBKT

2.9 LOUDSPEAKER HARDWARE AND SUPPORT STRUCTURE

A. All rigging truss modules, slings and hardware to meet a minimum of one of the following standards.
   1. ASME B30.26
   2. ASME B30.9
   3. OSHA 1910.184
   4. OSHA 1926.251
   5. UL 1480 31.3

B. Custom Loudspeaker Rigging
   1. For indoor practice field speaker cluster.
   2. Provide rigging drawings in accordance with Part 1 of this specification.
   3. Coordinate all rigging attachments with structure.
   4. Acceptable Manufacturer
      a. Polar Focus
      b. Adaptive Technologies

C. Shoulder Type Machinery Eye Bolts:
   1. Forged Steel - Quenched and Tempered.
   2. Fatigue rated at 1-1/2 times the Working Load Limit at 20,000 cycles.
   3. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements.
   4. Select size of product based working load limits required.
   5. Acceptable Product:
      a. Crosby Group S-279 / M-279 Series

D. Forged Eye Nuts:
   1. Forged Steel - Quenched and Tempered.
   2. Tapped with standard UNC class 2 threads after galvanizing.
   3. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements.
   4. Select size of product based working load limits required.
   5. Acceptable Product:
      a. Crosby Group G-400 Series

E. Anchor Shackles:
   1. Forged - Quenched and Tempered, with alloy pin.
   2. Working Load Limit permanently shown on every shackle.
   3. Hot Dip galvanized or Self-Colored.
   4. Product to meet the performance requirements of Federal Specification RR-C-271D Type IVA, Grade A, Class1.
   5. Select size of product based working load limits required.
   6. Provide all screw pin type shackles with mouse wire.
   7. Acceptable Product:
      a. Crosby Group G-213 / S-213 Series Round Pin
      b. Crosby Group G-209 / S-209 Series Screw Pin

F. Turnbuckles:
   1. Acceptable turnbuckle assembly combinations include: Eye and Eye, Jaw and Jaw, Jaw and Eye.
   2. End fittings are Quenched and Tempered, bodies heat treated by normalizing.
   3. Hot Dip galvanized.
   4. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements.
   5. Product to meet the performance requirements of Federal Specifications FF-T-791b, Type 1 Form 1 - CLASS 4, and ASTM F-1145.
   6. Select size of product based working load limits required.
   7. All end fittings to be moused to the body with mousing cable.
   8. Acceptable Product:
      a. Crosby Group HG-226 Series, Eye and Eye
      b. Crosby Group HG-227 Series, Jaw and Eye
      c. Crosby Group HG-228 Series, Jaw and Jaw

G. Wire Rope:
   1. Strands: 7 x 19 Utility Cable.
   2. Type: Galvanized.
   3. Select size of product based working load limits required.
   4. Acceptable Manufacturer:
      a. Wire Rope Corporation of America (WRCA)

H. Wire Rope Thimble:

1. Product to meet the performance requirements of Federal Specification FF-T-276b Type II.
2. Hot Dip galvanized.
3. Select size of product based wire rope size required for suspended load.
4. Acceptable Product:
    a. Crosby Group G-411 Series

I. Wire Rope Sleeves:
1. Type: Copper Duplex.
2. Select size of product based wire rope size required for suspended load.
3. Acceptable Product:
    a. Wire Rope Corporation of America (WRCA) SW-740 Series

2.10 ASSISTIVE LISTENING

A. ALS Transmitter (ALT, Type 1):
1. Configuration: Single-channel.
2. Frequency: 216 MHz.
3. Audio Input: Balanced, mic or line level, 3-pin XLR.
4. Provide power supply.
5. Provide 1-RU rack mount bracket.
6. Remote mounted antenna (ANT-HA)
7. Acceptable Product:
    a. Listen Technologies LS-71-216
        1) Listen Technologies LA-124 for device/panel mounted antennas
    b. William Sound FM-558 Pro
        1) William Sound ANT 034 for device/panel mounted antennas

B. ALS Receiver (Type 1):
1. Configuration: Single channel.
2. Frequency: 216 MHz.
3. Frequency agile to adjust various systems.
4. Receivers to be frequency adjustable for use in all venues.
5. Include an individual price for owner to purchase additional receivers.
6. Acceptable Product:
    a. Listen LR-4200-216 Receiver
        1) Listen LA-401 Ear Speaker
        2) Listen LA-402 Headset
        3) Listen LA-430 Neck Loop
    b. William Sound FM-R38
        1) William Sound EAR 022
        2) William Sound HED 024
        3) William Sound NKL 001

2.11 PRODUCTION INTERCOM

A. Wireless Intercom Base (ICW, Type 1)
1. 2 channel
2. Rack mountable
3. 2-wire and 4-wire compatible
4. 2.4GHz frequency
5. Acceptable Product:
    a. Clear Com BS210

B. Wireless Intercom Belt Unit (Type 1)
1. Acceptable Product:
    a. Clear Com BP210
        1) Clear Com CC-15-MD4 (mini DIN connector)
        2) Clear Com BAT41 Battery

C. Wireless Intercom Charge Base (Type 1)
1. Acceptable Product:
    a. Clear Com AC40A

2.12 PROJECTION SCREENS

A. Large Electric Projection Screen (PS, Type 1)
1. General: Provide manufacturer's standard units consisting of screen and other components as required for a complete installation.
2. Provide rigging and mounting hardware as required.

3. Comply with the following requirements for the viewing surface:
    a. Tab tensioned screen
    b. HD Progressive 1.3 surface material
    c. 16:10 aspect ratio
    d. Provide custom black drop
    e. Screen size: Reference Projection Screen Schedule in AV drawings
4. Acceptable Product:
    a. Da-Lite Tensioned Professional Electrol – Custom

B. Fixed Projection Screen (PS, Type 2)
1. General: Provide manufacturer's standard units consisting of screen and other components as required for a complete installation.
2. Provide rigging and mounting hardware as required.
3. Comply with the following requirements for the viewing surface:
    a. HD Progressive 1.3 surface material
    b. 16:10 aspect ratio
    c. Screen size: Reference Projection Screen Schedule in AV drawings
4. Acceptable Product:
    a. Da-Lite Da-Snap

C. Electric Projection Screen (PS, Type 3)
1. General: Provide manufacturer's standard units consisting of screen and other components as required for a complete installation.
2. Provide rigging and mounting hardware as required.
3. Comply with the following requirements for the viewing surface:
    a. Tab tensioned screen
    b. HD Progressive 1.3 surface material
    c. 16:10 aspect ratio
    d. Screen size: Reference Projection Screen Schedule in AV drawings
4. Acceptable Product:
    a. Da-Lite Tensioned Cosmopolitan Series

2.13 VIDEO PROJECTORS

A. Video Projector (PROJ, Type 1)
1. 3 LCD laser light source
2. Brightness 16,000 ANSI lumens
3. Native resolution 1920x1200
4. Control Communication RS-232C
5. Field verify throw distance to determine the appropriate required lens
6. Coordinate color with architect
7. Acceptable Product to include:
    a. Epson EB-PU2216 w/Chief VCTU, WMA2S, CMS003

B. Video Projector (PROJ, Type 2)
1. 3 LCD laser light source
2. Brightness 13,000 ANSI lumens
3. Native resolution 1920x1200
4. Control Communication RS-232C
5. Field verify throw distance to determine the appropriate required lens
6. Coordinate color with architect
7. Acceptable Product to include:
    a. Epson EB-PU2213 w/Chief VCTU

2.14 AV SOURCES

A. Wireless Presentation System (WPS, Type 1)
1. Wirelessly present content from laptops, smartphones, and tablet devices via built in Wi-Fi network capabilities or via an external Wi-Fi wireless network.
2. Present content from desktop or laptop computers via Miracast® screen mirroring technology or present content from Android™ and iOS® mobile devices with the AirMedia app.
3. Simultaneous display from up to 4 devices
4. HDMI output
5. Acceptable Product to include:
    a. Crestron Airmedia Receiver 3200-WF
    b. PW-2414WU

2.15 AUDIO ACCESSOIRES

A. Audio Amplifier (AUD, Type 1)
   1. Convert Stereo IHF Levels to Stereo PRO
   2. Independently Adjustable Gain
   3. Acceptable Product to include:
      a. RDL ST-UBA2
      b. PS-24AS

2.16 VIDEO SWITCHERS

A. Video Switcher (VSW, Type 1)
   1. Two HDMI Inputs
   2. One DTP3 twisted pair output on RJ-45
   3. Auto-switching between inputs
   4. Supports 4K/60
   5. HDCP 2.3 compliant
   6. Acceptable Product:
      a. Extron DTP3 T 203 (60-1885-52)

2.17 TRANSMITTERS/RECEIVERS

A. DTP Transmitter (DTP-TX, Type 1)
   1. Long Distance DTP Transmitter for HDMI - Decorator-Style Wallplate
   2. Converts HDMI to CAT5e/6.
   3. Transmits video with embedded audio, bidirectional RS-232 and IR, and Ethernet up to 330 feet (100 meters) over a shielded CATx cable
   4. Supports video resolutions up to 4K
   5. HDCP 2.3 compliant
   6. Coordinate color with Architect
   7. Acceptable Product:
      a. Extron DTP T HWP 4K 331 D (60-1421-52)
      b. Extron DTP T HWP 4K 331 D (60-1421-53)

B. DTP Receiver (DTP-RX, Type 1)
   1. Long Distance DTP Receiver for HDMI
   2. Converts CAT5e/6 to HDMI
   3. Receives video with embedded audio, bidirectional RS-232 and IR, and Ethernet up to 330 feet (100 meters) over a shielded CATx cable
   4. Supports video resolutions up to 4K
   5. HDCP 2.3 compliant
   6. Acceptable Product:
      a. Extron DTP HDMI 4K 330 Rx (60-1331-13)

2.18 USER INTERFACES

A. Button Panel (BP, Type 1)
   1. Fully configurable using Global Configurator Plus or Global Configurator Professional
   2. Two bidirectional RS-232 ports
   3. Two relays for controlling room functions
   4. Acceptable Product to Include:
      a. Extron MLC Plus 100 (60-1469-03)
      b. Extron PI 115 60-1233-02 (POE Type 1)

B. Touch Panel (TP, Type 1)
   1. Screen size: 7-inch diagonal
   2. Capacitive touch surface
   3. Resolution: 1024 x 600
   4. PoE powered
   5. Coordinate color with architect
   6. Include Extron RM 5 (70-1137-02) when rack mounted
   7. Acceptable Product to Include:
      a. Extron TLP Pro 725M (60-1563-XX)
      b. Extron PI 115 60-1233-02 (POE Type 1)
      c. Extron TLCA 1 (60-1748-10)
      d. Extron TLP Control Processor Upgrade (79-2577-01)

C. Touch Panel (TP, Type 2)
   1. Screen size: 11.6-inch diagonal

2. Capacitive touch surface
3. Resolution: 1920 x 1200
4. PoE powered
5. Acceptable Product:
    a. QSC TSC-101w-G3

2.19 AV NETWORK HARDWARE

A. Network Switch (AVSW, Type 1)
1. Managed
2. Gigabit switch
3. PoE+
4. Streaming compatible
5. Acceptable Product:
    a. Netgear M4250 Series
    b. Pakedge SX Series
    c. Luxul AMS Series
    d. QSC NS Gen-2 Series
    e. Approved Equivalent

2.20 POWER SYSTEMS

A. Power Sequencing
1. Power Sequencing system to be operated via low voltage button contact closures from either push buttons located on panels local to the event space or via a contact closure from a relative control system (DSP, Control Processor, etc.)
2. Devices to be sequenced “ON” in order of audio signal flow. Devices and equipment to be shut down in reverse order from “ON” sequence. Example “ON” order starting with:
    a. Source devices. (Media Players, Pre-amplifiers, etc.)
    b. Processing devices (DSP, Mixers, Video Switchers, etc.)
    c. Output devices (Amplifiers, Powered Speakers, etc.)
3. Devices not to be sequenced and to remain on for status and monitoring purposes to include but not limited to:
    a. Network switches and components.
    b. Equipment housing ventilation systems.
    c. Control system equipment responsible for providing control of Remote Power Sequencing system.

B. Power Sequencer (SEQ, Type 1)
1. 6 step sequencing
2. Low voltage contact closure
3. Configurable step delay
4. Acceptable Product:
    a. Middle Atlantic USC-6R

C. Power Sequencer (SEQ, Type 2)
1. Low voltage-controlled power sequencer
2. Rack mounted
3. 6 controlled outlets
4. 1 unswitched outlet
5. Acceptable Product:
    a. Middle Atlantic PDS-620R

D. Rack Power Distribution (RPD, Type 1)
1. Modular raceway power system.
2. Rack mountable vertical distribution.
3. Low voltage contact closures.
4. Coordinate wiring of high voltage components with electrical contractor.
5. Provide additional raceways if circuit count exceeds maximum raceway length
6. Coordinate wiring of high voltage components.
7. Acceptable Product:
    a. Middle Atlantic MPR-#A
        1) Middle Atlantic RLM-20A (Switched Module, as needed)
        2) Middle Atlantic RLM-30A (Switched Module, as needed)
        3) Middle Atlantic M-20A (Un-switched Module, as needed)

E. Rack Power Distribution (RPD, Type 2)
1. Rack mountable vertical distribution.

2. Used for additional outlets where needed.
3. Size strip to number of required outlets.
4. Acceptable Product:
    a. Middle Atlantic PDT Series
    b. Middle Atlantic PD Slim Series

F. Switched Power Distribution (SW POWER, Type 1)
1. Low voltage-controlled power distribution
2. Rack mounted
3. 3 controlled duplexes
4. 1 unswitched duplex
5. Acceptable Product:
    a. Middle Atlantic PDC-915R-6

G. Power Protection with Lights (POWER/LIGHT):
1. 20 Amp power system.
2. Eight switched AC outlets.
3. Acceptable Product:
    a. Furman Sound PL-PRO C
    b. Approved Equivalent

H. Rackmount Uninterruptible Power Supply (UPS)
1. Provide UPS systems to maintain power to all networking and processing equipment, including digital audio mixer systems and recording equipment.
2. UPS's shall be on-line style with sufficient battery reserve to operate for 15 minutes. Size each UPS unit for 25% additional capacity.
3. Rack mountable.
4. Acceptable Product:
    a. Middle Atlantic Select Series UPS
    b. APC Smart-UPS

I. Free Standing Uninterruptible Power Supply
1. Provide UPS systems to maintain power to all networking and processing equipment, including control room equipment.
2. UPS's shall be on-line style with sufficient battery reserve to operate for 15 minutes. Size each UPS unit for 25% additional capacity.
3. Free Standing
4. Acceptable Product:
    a. APC Back UPS PRO Series
    b. Approved Equivalent

J. Power Supplies:
1. As required.

2.21 EQUIPMENT HOUSING AND ACCESSORIES

A. General
1. Refer to drawings for equipment rack sizes and additional notes.

B. Portable Equipment Rack (Type 1)
1. Size: 8RU front with 12RU Top
2. Tapped 10-32 rack rails
3. Acceptable Product:
    a. SKB 1SKB19-R1208

C. Portable Equipment Rack (Type 2)
1. Rolling rack
2. 8RU
3. Acceptable Product:
    a. SKB 8U rSeries Rolling Rack

D. Rack Blanks (BLANK)
1. Flanged, aluminum panel.
2. Anodized finish.
3. Acceptable product:
    a. Middle Atlantic BL series

E. Rack Vents (VENT)
1. Flanged, aluminum panel.
2. Anodized finish.
3. Acceptable product:
    a. Atlantic VTP series

F. Cable Management
   1. Brush grommet panel
   2. Acceptable Product:
      a. Middle Atlantic BR series
G. Rack Drawers (DRAWER)
   1. Blank anodized finish
   2. Acceptable product:
      a. Middle Atlantic D series
H. Rack Mounted Sliding Shelf (SLIDE OUT SHELF)
   1. Finish: Black
   2. 1-RU rack mountable sizes.
   3. Acceptable product to include:
      a. Middle Atlantic SS
I. Equipment Rack Screws:
   1. Install rack mounted equipment with black 10-32 star post security screws with flat nylon washers.
   2. Quantity as required.
   3. Provide one spare bit located in a clear plastic bag attached to the inside of each equipment rack in plain view.
   4. Acceptable Product:
      a. Middle Atlantic HTX

2.22 PLATES AND PANELS
A. General
   1. Provide plates and panels and as described in Drawings. Engrave as shown on Drawings. Other Plates and Panels may be required to satisfy the requirements of the Work.
   2. Custom panels shall be 1/8-inch thick aluminum, standard EIA sizes, brushed, anodized finish unless otherwise noted. Brush in direction of aluminum grain only.
   3. Plate finish shall be coordinated with the Owner. Plastic plates are not acceptable.
   4. Panel, plate and label engraving shall be 1/8-inch block sans serif characters unless noted otherwise. On dark panels or pushbuttons, letters shall be white; on stainless steel or brushed natural aluminum pushbuttons, letters shall be black.
B. Custom and/or Engraved Panels:
   1. Custom panels constructed of 1/8 inch brushed aluminum
   2. Coordinate finishes with Architect
   3. Acceptable Manufacturers:
      a. EMG
      b. RCI Custom
      c. ProCo
      d. Radial Engineering

2.23 CONNECTORS
A. XLR Panel mount Connectors
   1. Provide panel mount XLR connectors with unified metal shell.
   2. RF-Protector connectors.
   3. Shell Color: Black.
   4. Contacts: Silver.
   5. Terminations: Solder.
   6. Acceptable Product:
      a. Male Connectors: Neutrik NC*MD-L-1-BAG Series
      b. Female Connectors: Neutrik NC*FD-L-1-BAG Series
B. XLR Cable Connectors
   1. Provide XLR cable connectors with die cast shell.
   2. No-screw type assembly.
   3. Chuck-type strain relief.
   4. Shell Color: Black.
   5. Contacts: Silver.
   6. Terminations: Solder.
   7. Acceptable Product:
      a. Male Connectors: Neutrik NC*MX-BAG Series
      b. Female Connectors: Neutrik NC*FX-BAG Series
C. Speaker Connectors
   1. Provide 4 or 8 conductor connector

2. Shell Color: Black
3. Terminations: Solder or tab
4. Acceptable Product:
    a. Neutrik NL4MPXX
    b. Neutrik NL8MPRXX

D. BNC Cable Connectors
1. Provide cable mount BNC connectors.
2. Contacts: Brass or copper.
3. Terminations: Crimp.
4. Acceptable Product:
    a. Kings
    b. Amp
    c. Amphenol
    d. Canare
    e. Liberty

E. HDMI Connectors
1. Provide panel mount HDMI feedthrough connectors
2. HDMI 2.0 compliant
3. Acceptable Product:
    a. Neutrik NAHDMI-W

F. Ethercon Panel Connectors
1. Provide panel mount Ethercon CAT6 connectors
2. Metal housing
3. Shielded
4. Acceptable Product:
    a. Neutrik NE8FDP-B

2.24 LOOSE CABLES

A. Microphone/Instrument Cables:
1. Cable properties:
    a. Quad 24 gauge stranded with braided shield, flexible hard service jacket.
    b. Color: Black
    c. Each cable to be provided with a Velcro style tie wrap.
        1) Minimum 5/8” width
        2) Length appropriate to wrap minimum 1.5 times around a cable loop of 14-inch diameter.
        3) Standard of performance:
            a) Rip-Tie CABLEWRAP
2. Microphone Cable:
    a. Type 06 – 6 foot, with Gray collar on connector
    b. Type 25 – 25 foot, with Blue collar on connector
    c. Type 50 – 50 foot, with Green collar on connector
    d. Type 100 – 100 foot, with Red collar on connector
3. Instrument Cable
    a. Type 06 - 6 foot, 1/4-1/4
    b. Type 10 – 10 foot, 1/4-1/4
4. Acceptable cable:
    a. Whirlwind MKQ series
    b. Canare StarQuad
    c. ProCo AmeriQuad

B. Intercom Cables:
1. Cable properties:
2. Quad 24 gauge stranded with braided shield, flexible hard service jacket.
3. Color: Black
    a. Each cable to be provided with a Velcro style tie wrap.
    b. Minimum 5/8” width
    c. Length appropriate to wrap minimum 1.5 times around a cable loop of 14-inch diameter.
    d. Standard of performance:
        1) Rip-Tie CABLEWRAP
4. Intercom Cable:
    a. Type 06 – 6 foot, with Gray collar on connector
    b. Type 25 – 25 foot, with Blue collar on connector

c. Type 50 – 50 foot, with Green collar on connector
d. Type 100 – 100 foot, with Red collar on connector

5. Acceptable cable:
a. Whirlwind MKQ series
b. Canare StarQuad
c. ProCo AmeriQuad

C. Speaker Cables:
1. Cable properties:
a. Color: Black,
b. Connector: NL4 to NL4 or NL8 to NL8
c. Wire: 12 gauge stranded, SJ jacket.
d. Each cable to be provided with a Velcro style tie wrap.
1) Minimum 1” width
2) Length appropriate to wrap minimum 1.5 times around a cable loop of 14-18 inch diameter.
3) Standard of performance:
a) Rip-Tie CABLEWRAP

2. Speaker Cable:
a. Type 06 – 6 foot, with Gray collar on connector
b. Type 25 – 25 foot, with Blue collar on connector
c. Type 50 – 50 foot, with Green collar on connector
d. Type 100 – 100 foot, with Red collar on connector

3. Acceptable cable:
a. Whirlwind NL series
b. Approved Equivalent

D. Ethernet Audio Cables:
1. Cable properties:
a. Color: Black
b. Neutrik Ethercon Connector
c. Rugged Tactical Jacket
d. Each cable to be provided with a Velcro style tie wrap.
1) Minimum 5/8” width
2) Length appropriate to wrap minimum 1.5 times around a cable loop of 14-inch diameter.
3) Standard of performance:
a) Rip-Tie CABLEWRAP

2. Ethernet Audio Cable:
a. Type 06 – 6 foot, with Gray collar on connector
b. Type 25 – 25 foot, with Blue collar on connector
c. Type 50 – 55 foot, with Green collar on connector
d. Type 100 – 100 foot, with Red collar on connector

3. Acceptable cable:
a. ProCo DuraCat
b. Approved Equivalent

E. Power Extension Cables:
1. Cable properties:
a. Color: Black
b. 12-gauge, 3 conductor, stranded, flexible hard service jacket.
c. Each cable to be provided with a Velcro style tie wrap.
1) Minimum 1” width
2) Length appropriate to wrap minimum 1.5 times around a cable loop of 14-18 inch diameter.
3) Standard of performance:
a) Rip-Tie CABLEWRAP

2. Power Extension Cable:
a. Type 12 – 12 foot,
b. Type 25 – 25 foot,
c. Type 50 – 50 foot,
d. Type 100 – 100 foot

3. Acceptable cable:
a. ProCo E-Cords series
b. Approved Equivalent

2.25 CABLES & WIRING

A. General
1. All electrical conductors installed under this contract, except where otherwise specified, shall be soft drawn annealed stranded copper having a conductivity of not less than 98% of pure copper, and meet appropriate ratings (e.g. CMR, CMP, etc.)
2. Cable shall carry appropriate fire rating (e.g. CMR, CMP, OFNR, OFNP, etc.) on jacket of cable.
3. Where cables are routed through cable tray, provide tray rated cable of equal specification.
4. Where speaker cables are run exposed through a return air plenum, provide plenum rated cable of equal specification.
5. Shielded cables located in raceways shall have aluminum foil shield with drain wire.
6. The Belden cables listed below are approved for use on this project and are listed to set the acceptable standard of performance. If field conditions or actual cable pathway requires tray or plenum cable, provide version of cable that meets required rating. Cables from West Penn, Windy City Wire, Liberty, Commscope and Gepco are also acceptable provided they meet the performance specifications of the approved listed cables.

B. Microphone/Line Level Wire
1. Provide shielded 22 AWG cable.
2. Cable to be PVC jacketed.
3. Jacket color: black.
4. Acceptable Product:
   a. Belden 9451

C. Production Intercom Wire
1. 18 AWG shielded
2. Cable capacitance to be less than 17 pF/ft
3. Acceptable Product:
   a. Belden 6340FT
   b. Belden 9207

D. Speaker Level Wire
1. For applications less than 300W and/or 300 feet
2. Provide 16 AWG cable.
3. Cable to be CL3R or CL2P rated.
4. Jacket color: gray.
5. Acceptable Product:
   a. Belden 5200UE

E. Speaker Level Wire
1. For applications less than 600W and/or 600 feet
2. Provide 14 AWG cable.
3. Cable to be CL3R or CL2P rated.
4. Jacket color: gray.
5. Acceptable Product:
   a. Belden 5100UE

F. Speaker Level Wire
1. For applications less than 2400W and/or 1000 feet
2. Provide 12 AWG cable.
3. Cable to be CL3R or CL2P rated.
4. Jacket color: gray.
5. Acceptable Product:
   a. Belden 5000UE

G. Speaker Level Wire
1. For applications more than 2400W and/or 1000 feet
2. Provide 10 AWG cable.
3. Cable to be CL3R or CL2P rated.
4. Acceptable Product:
   a. Belden 5T00UP

H. Category Cable
1. 23-gauge solid cable
2. Category 6+ Enhanced
3. 4 pair, UTP
4. Acceptable Product
   a. Belden 2412F

I. Shielded Twisted Pair Cable
1. 24-AWG solid copper cable inside an overall braid and foil shield

2. Meets performance requirements set by HDBaseT Alliance
3. Meets or exceeds manufactures requirements for video transport device

J. Relay/Control Level Wire
1. Provide unshielded 22 AWG cable.
2. Cable to be CMR or CMP rated.
3. Provide number of conductors where required.
4. Acceptable Product:
a. Belden Cable

K. Wireless /Assisted Listening Antenna Cable
1. For applications less than 100 feet
2. 16-gauge, stranded center conductor
3. RG8/X
4. 95% braided shield
5. Acceptable Product:
a. Belden 9258

L. Wireless /Assisted Listening Antenna Cable
1. For applications between 100 and 400 feet
2. 10-gauge, stranded center conductor
3. RG8/U
4. 90% braided shield
5. Acceptable Product:
a. Belden 9913

M. HDMI Cable
1. Provide pre-molded cables in lengths as required
2. Acceptable Product:
a. Crestron® Certified HDMI® Interface Cable
b. Extron Ultra Series HDMI Cable
c. Comprehensive Microflex Pro AV/IT 18Gbps

2.26 MISCELLANEOUS

A. Cable Tray
1. Refer to AV drawings for size and lengths
2. Width: 18-inches
3. Powder coated steel
4. Follow manufacturers recommendation for ladder support
5. Acceptable Product:
a. Middle Atlantic CL series
1) Provide Middle Atlantic mounting hardware and connectors

B. Relay (RLY, Type 1):
1. Acceptable Product:
a. RDL ST-LCR1

C. Headphones (Type 1):
1. Acceptable Product:
a. Sony MDR-7506
b. Shure SRH440
c. Approved Equivalent

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate incorporation of the Work specified herein with other project work so as to facilitate a cohesive final Products.

B. The installation recommendations contained within ASDI and Telecommunications Distribution Methods Manual are mandatory minimum standards and requirements.

C. Mount equipment and enclosures plumb and level.

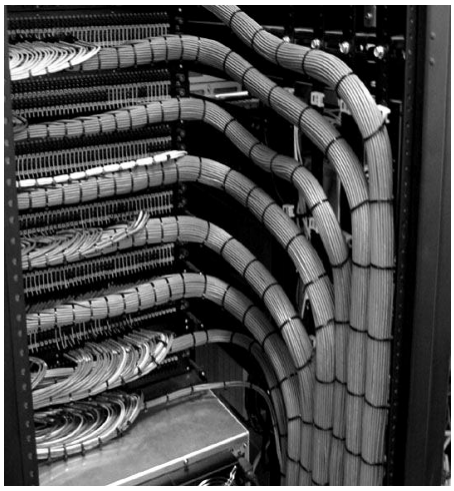
D. Permanently installed equipment to be firmly and safely held in place. Design equipment supports to support loads imposed with a safety factor of at least five. Seismic bracing shall be installed on appropriate equipment where local codes require such installation.

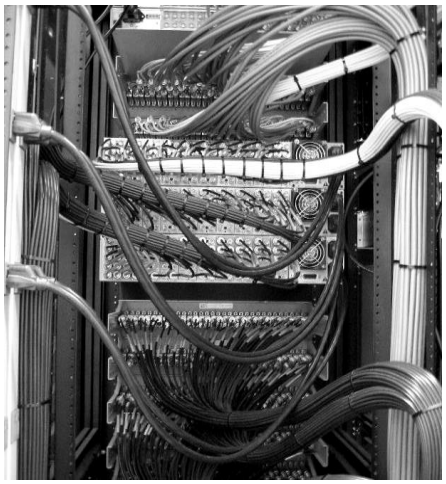
E. Verify all locations of equipment in all rooms with Owner’s Representative, Owner, and Consultant.

3.2 INSTALLATION

A. Installation of cable and wiring
   1. Cabling and Wiring:
      a. Install cable in a manner to adhere to manufacturer's specifications for maximum cable pulling tension, minimum bend radius, and restrictions.
      b. Provide appropriate support at all horizontal-to-vertical transitions in order to keep the weight of the cable from degrading at the point of transition.
      c. If a J-hook or trapeze system is used to support cable bundles, all horizontal cables shall be supported at a maximum of 48-inch (1.2 meter) intervals. At no point shall the cables rest on light fixtures, acoustic ceiling grids, panels, conduits, sprinkler pipe, water pipe and/or HVAC system ducting.
      d. Horizontal distribution cables shall be bundled in groups of no more than 50 cables when being supported by J-Hook or trapeze systems. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance. An exception to this rule is when cable is installed in cable tray systems.
      e. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices
      f. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, install appropriate carriers to support the cabling.
      g. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced prior to final acceptance at no cost to the Owner.
      h. Cables shall be identified by a self-adhesive machine label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.
      i. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
      j. Provide splice free wiring and cabling from origination to destination. Cables shall be installed in continuous lengths from origin to destination (no splices). Properly designed transition points, or consolidation points are not considered 'splice' points.
      k. Make joints and connections with rosin-core 60/40 solder or with mechanical connectors specifically intended for the type and class of cable being used. Where spade lugs are used, crimp properly with ratchet type tool.
      l. Take precaution to prevent and guard against electromagnetic and electrostatic hum. For line-level audio signal, float cable shield at one end. Shield not connected to be folded back over cable jacket and covered with heat-shrink tubing. Do not cut off unused shield.
      m. Isolate cables and wires of different signals or different levels; and separate, organize, and route to restrict channel crosstalk or feedback oscillation in any amplifier section. Keep wiring separated into groups for microphone level circuits, line level circuits, loudspeaker circuits, and power circuits.
      n. Connect cable to active components through XLR connections whenever multiple formats are available. Make connections to speaker transformers with properly sized closed end connectors crimped with factory approved ratchet type tool. Wire nut or "Scotchlock" connectors are not acceptable. Do not wrap audio cable splices or connections with adhesive backed tape.
      o. Cover edges of cable and wire pass-through holes in chassis, housings, boxes, etc., with rubber grommets or Brady GRNY nylon grommetting.
      p. Execute wiring in strict adherence to:
         1) Phillip Giddings. Audio System Design and Installation. Indianapolis: Howard W. Sams & Co., 1990.
         2) Don Davis and Carolyn Davis. Appendix II, Recommended Wiring Practices. Sound System Engineering, 2nd Edition. Indianapolis: Howard W. Sams & Co., 1989.
         3) AV Installation Handbook Second Edition: The Best Practices for Quality Audiovisual Systems, Infocomm, 2009
   2. Equipment Housing Cabling and Wiring:
      a. Lace, tie, or harness wire or cable as required herein, and in accordance with accepted professional practice. Dress, lace or harness all wire or cable to prevent mechanical stress on electrical connections; no wire or cable shall be supported by a connection point. Install cable and wire neatly tied in manageable bundles with cable lengths cut to minimize excess cable slack but still allow for service and testing. Provide horizontal support bars if cable

bundles sag. Reference photos below for standard of quality.





b. Provide adequate service loops so that equipment mounted on rack slides may be pulled fully out, to their locked position without straining cable.
c. Neatly bundle excess AC power cable from housing mounted equipment with plastic cable ties.
d. Provide plastic cable ties or Velcro straps to bundle cabling and wiring. Electrical tape and adhesive backed cable tie anchors are not acceptable.
e. Install with connections completely visible and labeled.
f. Provide termination resistors, if required, of 5 per cent tolerance; fully visible and not concealed.

B. Installation of connectors, plates & panels:
1. Install panel mounted connectors rigidly attached to panels, plumb and level.
2. Custom rack panels shall be 1/8 inch thick aluminum, standard EIA sizes, brushed black anodized finish (brushed in direction of aluminum grain only), unless otherwise noted.
3. Custom connector plates (speaker, microphone, etc.) are typically stainless steel, unless otherwise noted or specified. However, verify plate finish with Architect.
4. Install XLR type connectors in accordance with IEC-268 standard, with a wiring scheme of pin 2 hot (high), pin 3 (low), and pin 1 screen (shield).
5. Other Plates and Panels may be required to satisfy the requirements of the Work.

C. Installation power and grounding:
1. Coordinate final connection of power and ground wiring to housings.
2. Hardwire power wiring directly to internal AC receptacles to ensure uninterrupted operation.
3. Provide 3-conductor, isolated ground, 120 VAC outlets as required within each housing. Provide a minimum of two spare outlets in each rack.
4. Provide a copper ground buss top to bottom in each housing, insulated from the housing. Ground equipment chassis not having a three wire power cord to these busses using 6/32 nuts, bolts and lock-washers with No. 12 wire. Connect green ground wire from each AC outlet in housing to this buss bar.
5. Replace manufacturers supplied 18 gauge IEC power cords with UL listed 18 gauge pre-molded 6”, 12”, 18”, or 24”. Use minimum length required. No looped or cable tied IEC power cords will be permitted within the equipment rack.
6. Replace manufacturers supplied 14 gauge IEC power cords with UL listed 14 gauge pre-molded 18” or 36” for all equipment IEC capable. Use minimum length required and minimize looped or cable tied IEC power cords present in the equipment rack.

D. Installation of electronic equipment:
1. Take appropriate precautions against electrostatic discharge (ESD). Establish a personal ground before handling electronic equipment through the use of a grounded wrist wrap and/or an anti-static floor pad.
2. Take appropriate precautions to protect the equipment from damage during installation. Equipment to be installed free of damages, scratches, dents, etc.
3. Mount trim potentiometers, custom circuit cards, relays, and transformers (except large 70V units) in shielded enclosures, and mark their function and connections with engraved lamicoid labels.
4. Mount equipment plumb and level, firmly and safely held in place.

E. Installation of equipment housing:
1. Mount equipment in racks and consoles and fully wire and test before delivery to job site. If field conditions prevent prior assembly of racks, notify Owner in writing that racks will be fabricated on site and the reasons for the change.
2. Secure rack mounted devices utilizing all available fastener mounting positions on device.
3. Provide rear support for housing mounted equipment greater than 15 inches deep.
4. Provide blank panels to fill unused panel space within the equipment housing.
5. If Key door locks are required, key each housing type alike.
6. Looking at the rack from the rear, locate AC power and speaker wiring on the left; line level audio, video, and RF wiring on the right.
7. Provide shaft locks or security covers on non-user operated equipment having front panel controls. These panels are to be installed at the conclusion of testing.
8. If forced air active thermal management is used, provide ventilation blocking material on the front, sides, and rear of the equipment rack as needed. Reference Middle Atlantic Products “Controlling the Temperature Inside Equipment Racks”.
9. Panels or equipment mounted on the rear rack rails shall not block access to any front mounted components.
10. If equipment rack is not equipped with casters, provide two inch high wood base to isolate equipment rack from floor. Wood base should be capable of supporting the load.

F. Installation of loudspeakers:
1. The Contractor is responsible for final design and engineering of loudspeaker rigging, attachments, brackets, and hoisting.
2. Loudspeakers shall be mounted at the operating position in a safe, secure, and permanent manner.
3. Provide custom rigging as needed. In addition to the ANSI standards below, custom rigging shall be built to include compliance with the following American Welding Society standards:
   a. AWS-D1.1/D1.1M:2020
   b. AWS-D1.2/D1.2M:2014
4. Loudspeaker manufacturer supplied mounting brackets or rigging shall be built to the applicable ANSI standards listed below, with testing and/or traceability data provided as part of shop drawings submittal.
5. Suspension and Mounting:
   a. Static and dynamic equipment loads shall be suspended or mounted in compliance with the following ANSI/ESTA standards, using the latest available versions of the standards:
      1) ANSI E1.4-2-2021 Statically Suspended Rigging Systems
      2) ANSI E1.56-2018 Rigging Support Points
      3) ANSI E1.6-1-2021 Powered Hoist Systems
      4) ANSI E1.8-2012 Loudspeaker Enclosures Intended for Overhead Suspension
   b. Rigging, mounting, and support systems for overhead suspended loudspeakers shall be reviewed and certified by a registered Professional Engineer (PE), in the employ of the Contractor, licensed to practice in the State in which the project is located. Documentation shall be included as a submittal item. Once the systems are installed, the PE shall physically inspect, at the Contractor’s cost, the methods and means used to verify compliance with the original design.
6. General Guidelines:
   a. Reference Project structural documents.
   b. Site and/or special inspections may be required if requested by the Owner.
   c. Paint loudspeakers, supports, and related hardware color as directed by the Owner.
   d. The aiming direction of all loudspeakers shall be adjustable by no less than ±5 degrees horizontally and vertically.
   e. Loudspeakers are to be oriented parallel to their mounting surface unless otherwise noted.
   f. Provide a safety cable connected to a secondary location for each loudspeaker.
   g. All loudspeakers located in ceiling tiles shall be located in the center of the tile unless noted otherwise.
   h. Paint loudspeakers to match surroundings. Confirm color selection with the Architect during the submittal phase.
   i. Exterior loudspeaker cabinets shall be constructed of materials designed for permanent outdoor exposure conditions with a minimum IP 54 rating, and a minimum expected 10-year life span. Exterior and interior surfaces of the cabinets shall be protected from the effects of water, moisture, and humidity. The exterior surface shall also be protected from the effects of ultraviolet radiation to prevent fading and color change. The cabinets shall be shaped and oriented in a manner that minimizes the possibility of water pooling on any cabinet surface.

Associated hardware shall be inherently non-corrosive, performing to the standards of 304 Stainless Steel or higher.

G. Installation of projectors:
1. Confirm distance of specified projection lens before mounting projector.
2. Projectors shall be mounted plumb and level at the operating position in a safe, secure and permanent manner.
3. All hardware required to locate the mount and projector at the required location shall be provided.
4. Projectors shall be mounted using tamper proof secure hardware.
5. Contractor may be required to adjust projection screen and lift upper and lower limit switches for projection screens and lifts specified elsewhere and not installed as part of this Contract.

H. Installation of flat panel monitors:
1. Confirm location before mounting.
2. Monitors shall be mounted plumb and level at the operating position in a safe, secure and permanent manner.
3. All hardware required to locate the mount and monitor at the required position shall be provided.
4. Locate monitor on the center line of the room unless noted otherwise.

I. Loose Equipment
1. Provide loose equipment as indicated on drawings.
2. Unpackage and assemble items.
3. Place items in designated storage or refer to Owner for direction on final location and storage of loose equipment.

3.3 FIRESTOP

A. A fire-stop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Fire-stop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.

B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate fire-stop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly fire-stopped.

C. Fire-stop systems shall be reviewed by a Professional Engineer (PE) licensed to practice in the State in which the project is located. Stamped drawings showing the fire stop systems shall be included as a submittal item. Once the systems are installed, the engineer of record for the firestop system shall physically inspect the methods and means used to verify compliance with the original design.

D. A drawing showing the proposed fire-stop system, stamped/embossed by the PE shall be provided to the Owner’s Technical Representative prior to installing the fire-stop system(s).

E. All fire-stop systems shall be installed in accordance with the manufacturer’s recommendations and shall be completely installed and available for observation by the local authorities prior to cable system acceptance.

3.4 CONTROL SYSTEM PROGRAMMING

A. Aux Gym
1. Low voltage controls by control system
a. Power Sequencing
1) Power Up: Triggered by control system via touch panel STANDBY Control system to begin System Power Up Sequence. Sequence to be timed to trigger sequencing systems in accordance with the sequence specified in Power Sequencing Systems in this specification. During Sequence, Control System to flash the STANDBY button on touch panel until sequence is complete. Upon completion, Control System to indicate that the system is powered on and ready via solid color on STANDY button on touch panel.
2) Power Down: Triggered by control system via touch panel SYSTEM OFF, Control system to begin System Power Down Sequence. Sequence to be timed to trigger sequencing systems in accordance with the sequence specified in Power Sequencing Systems in this specification. During Sequence, Control System to flash the SYSTEM OFF button on the touch panel until sequence is complete. Upon completion, Control System to indicate that the system is powered off by solid color on SYSTEM OFF button on touch panel.
2. DSP functions triggered by AV Control System touch panel.
a. STANDBY: Audio DSP preset to mute all output capability of the system.

b. EVENT: This preset to change Audio DSP Source Matrix to route the outputs of the portable cart connections to the main loudspeakers. All outputs of the DSP to be unmuted.
1) COURT MUTE: Provide mute button for loudspeakers providing coverage of the court.
2) Volume controls: Provide volume controls for sources shown in DSP diagram.
3) Mute controls: Provide mute buttons for sources shown in DSP diagram.

3. Low voltage controls for DSP
a. PAGE: Triggered by the paging and/or fire alarm system, this preset to change the Source Matrix to source the paging/fire alarm system audio feed to the main loudspeakers. System to remain in this state until the trigger has been released.

B. Transport Control
1. Provide standard Stop, Play, Pause, Fast Forward and Rewind for each playback device and menu control for DVD players. Buttons should be arranged in a conventional fashion that will be familiar to the normal user.
2. The selected control function should be displayed by showing the appropriate button “pressed”. It should remain this way until another function is selected.
3. For devices that will go into a standby mode after a period of time, the control system shall sense this mode and restore normal operating mode once a transport function has been selected. This may require the use of current sensors to determine the state of the unit. No direct user action should be required at the playback device to restore the normal operating mode.

C. Screen/Shade Control
1. In addition to up-down functions, provide a Stop function to allow the movement to be halted. Once movement has been stopped, the up or down buttons should resume travel in the selected direction.
2. Control system shall not prevent screen/shade wall controls from being used as well.
3. Touch panel controls should be readily accessible to the user to permit direct control of shades or screen with having to navigate through multiple control pages.

D. Room Combining
1. Combining of adjacent areas shall be done through a graphical representation of the physical areas to be combined. Use of a floor plan metaphor is recommended with the graphic oriented correctly with respect to control panel location.
2. Use buttons or other appropriate objects placed along the common wall to enable the combining function.
3. When spaces are combined, the graphic appearance of those areas shall change to reflect this configuration. Once an area is separated from a combination, the color of its area should revert to the normal room color.
4. Common control functions between combined rooms shall be linked, allowing control of the combined area from any one of the touch panels. Examples of common functions include:
a. Background music selection,
b. Background music volume
c. Background music muting
d. Lighting preset recall
e. Master volume (not individual channel volume)
5. When combining adjacent rooms, the control system shall force the common functions to a predetermined default configuration so all rooms have the same configuration.
6. To avoid unintentional changes, a control panel will not be able to operate a function in a remote location without also operating that same function in the room where the panel is located.

E. Level Control
1. Objects requiring level adjustment such as volume or tone controls shall be through Up/Down buttons with a graphical representation of the actual level.
2. Increment of level change to be adjusted for reasonable range without the need to push the Up or Down buttons needlessly.

F. Volume Mute
1. Where the ability to mute the sound is needed, the button shall use the label “Vol On” and “VOL OFF” instead of Mute and Unmute. When in a “VOL OFF” mode, pushing the “VOL UP” button shall restore the sound and bring the system out of the muted mode.
2. VOL ON/OFF buttons shall change color to indicate the status of the button.

G. Standard Colors
1. Control functions shall be color coded to add clarity and show relationships between different groups of controls.
2. The color Red shall be reserved to indicate a fault or abnormal condition.

3. Green may be used to indicate normal operation, but may be used for standard control colors as well.
4. Similar controls should maintain the same color scheme across all control pages.
5. When a function is selected, the graphical depiction of that button should appear to be pressed and its color change to a darker shade of the regular button color.
6. Color schemes used for background and foreground objects should be selected to be complimentary and provide a consistent theme throughout the control pages.

H. Minimum Button Size and Placement
1. Minimum visual size of a button is 3/8” wide by 1/4” high.
2. Spacing between buttons should be no less than 1/16”.
3. Where buttons are immediately adjacent, the active selection area of the button should be reduced to 80% of the visual area of the button.

I. Button Actions
1. When a function on a control page is selected, that button or visual object associated with that function should change to reflect what has been chosen.
2. For functions that are momentary selections (i.e., VOL UP), the change of state is visible for as long as the button is being pressed.
3. For function that are maintained selections (i.e., PLAY), the change of state remains visible until another function is selected and resets the previous function.
4. The state change of a button or visible object should depict real-world objects as much as possible including the appearance of the button be pressed inward, change in shade of the original color, but not a change in hue.

J. Labels
1. Use of simple words or titles are preferred to indicate functionality, navigation and system status.
2. Use of stylish symbols should be avoided unless their identity is commonly recognized by the general public. Standard symbols for transport functions are acceptable.
3. Labels should be presented in a clear, sans serif type face that will remain legible on lower resolution touch panels.
4. Where physical buttons are present along the side of a touch panel, these buttons should be engraved and filled with a contrasting color.

K. Power On/Off
1. For panels requiring an ON/OFF control, these functions should be linked through current sensors or other methods for the control system to detect the power on condition of the component being controlled.
2. Powering off a system should not interfere with the ability of a projector to complete its cool down cycle.

L. Look & Feel
1. Control pages should utilize a clean, elegant but stylish appearance.
2. Use a common graphical template across all control pages for a consistent look.
3. The touch screen layout should utilize graphical elements such as drop shadows, gradient fills and transparency to provide a pleasing overall appearance.
4. Utilize graphical representations of floor plans to convey location information.
5. Include company logos, icons or watermarks to portray the corporate identity.
6. Provide clear navigation tools for moving between control pages.
7. Each sub-page should have a “BACK” button to return to the previous page. This button should appear in the same location on each page.
8. Provide a “HELP” button or icon on each user page to provide clear, non-technical instructions on how to use the functions available to regular users.

M. Security
1. Provide password access to control pages not intended to be accessed by the general public.
2. Unless otherwise noted, provide a minimum of three levels of access
   a. General User
   b. Non-Technical Employee
   c. AV Technician
3. Segregate the control functions to only allow authorized individuals access to more sophisticated control pages.
4. Provide a timeout feature to automatically return the control panel back to the default opening screen after 30 seconds of inactivity. After this reset, passwords must be reentered to return to a previous control page.

N. Presets
1. For systems that have different operating modes or configurations, provide the ability to store and recall preset combinations of system settings.

2. Provide a “Preset” page that permits a minimum of five presets to be recalled. Each button to include a label describing the function or configuration associated with that button.
3. Provide the ability for new presets to be stored over previous settings. New preset to be able to change the label to reflect the new or revised configuration.
4. When a preset has been recalled, the control page should indicate the active configuration.

3.5 LABELING OF EQUIPMENT

A. Provide each terminal strip with a unique descriptor and a numerical designator for each terminal. Show terminal strip descriptor and designator on system schematic drawing.
B. Provide logical and legible cable and wiring label permanently affixed for easy identification.
1. Labels on cables to be adhesive strip type covered with clear heat-shrink tubing. Factory stamped heat shrink tubing may be used in lieu of the adhesive strip style.
2. Wiring designator to be an alpha-numeric code unique for each cable. Actual cable designation assignments to be determined by Contractor. Add cable designation codes to system schematic drawings.
3. Locate the cable designator at the origination and destination of each circuit within 3 inches of the point of termination or connection. Provide cable designator on circuits with intermediate splice points with an additional suffix to indicate each segment.

3.6 ENGRAVING

A. Text font: 1/8 inch block sans serif characters unless noted otherwise.
B. On dark materials, provide white characters; on stainless steel or brushed natural aluminum plates, or light-colored materials, provide black characters.
C. Provide at least two lines of text with first line listing the general device name, e.g., amplifier. Second line to include schematic reference of the device, e.g., AMP-1.
D. Equipment label: black with white characters except where indicated.

3.7 COMMISSIONING

A. Prior to energizing or testing the system, ensure the following:
1. All products are installed in proper and safe manner according to manufacturer’s instructions.
2. Insulation and shrink tubing are present were required.
3. Dust, debris, solder splatter, etc. is removed.
4. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.
5. Labeling has been provided.
6. Temporary facilities and utilities have been properly disconnected, removed and disposed of off-site.
7. Products are neat, clean and unmarred and parts securely attached.
8. Broken work, including glass, raised flooring and supports, ceiling tiles and supports, walls, doors, etc. have been replaced or properly repaired, and debris cleaned up and discarded.
B. Prior to energizing the System verify and perform the following tests and adjustments in compliance with applicable EIA standards.
1. Electronic devices are properly grounded.
2. Test each AC power receptacle with a circuit checker for proper hot, neutral and ground connections.
3. Verify each individual component is operating properly.
4. Verify each individual component’s performance meets the manufacturer’s published performance for this unit.
5. Measure and record the DC resistance between the technical ground in any equipment rack or console and the main building ground. Resistance should be 0.15 ohms or less.
C. Speaker Circuit Verification Test
1. Measure the impedance of each speaker line leaving the equipment racks.
2. For constant voltage systems measure the impedance at 100 (or 250) Hz, 1 KHz and 8 (or 10) KHz of each line leaving the equipment rack with the line disconnected from the driving source. For band limited devices, use a frequency appropriate for the operating range of the transducer.
3. When documenting the results of these tests, include the calculated impedance based on number of units on a line and the size and distance of the run. Correct any field readings that differ more than 20% from the calculated impedance.
4. Include the results of the tests in the Project Record Manual.
D. Speaker Polarity Verification Test
1. Use an electronic polarity checker, TEF-20, SYSID, SIM II, Smaart, or other similar device to test each loudspeaker. All speakers should have the same relative polarity.
2. Follow manufacturer’s recommendations in conducting the tests.

3. Include the results of the tests in the Project Record Manual.

E. Audio Signal Paths
1. Verify operation from each source device through all switching, amplification and distribution devices.

F. System Gain Adjustment
1. Adjust each active device to have proper gain structure from the mixer output to the input of the amplifier.
2. With all amplifiers turned off, connect a sine wave or pink noise generator to the input of the mixer. Using an RMS AC voltmeter with a dB scale, adjust the mixer to an output between -10 and 0 dBu. Once the level has been established, it should remain unchanged throughout the test. All equalizers should be set flat for this test.
3. Follow the signal flow from the mixer to each subsequent component. Measure the input level and output level of each device at the point of connection to the device. The input level reading should differ no more than 0.25 dB from the level recorded for the preceding device. Diagnose and correct the wiring or equipment when any readings exceed this range.
4. Adjust the output of each component to achieve the proper output level.
5. Record the output levels of each device in the Project Record Manual.

G. Signal Delay Adjustment
1. Adjust the delay to each subsystem to ensure proper synchronization between the main speakers and delayed speakers.
2. Using a TEF 20, SYSID, Smaart, SIM II, or other acceptable time based measurement system, measure the arrival time of the distant signal and then measure the arrival of the local signal.
3. Based on the arrival times measured, adjust the delay applied to the local speakers to synchronize them with the distant speakers. Repeat the test to verify the delay has been set to within 1 ms of the arrival of the distant signal. Once the precise delay time has been determined, provide an additional 10 ms of Haas effect delay to maintain directional orientation toward the original sound source.
4. Continue to test and adjust each separate subsystem with a dedicated delay channel.
5. Provide hard-copy printout of each delay adjustment showing first the arrival times with no delay set and then the result after the delay has been adjusted. Record the settings of each delay in the Project Record Manual.

H. Remote Input Verification Test
1. Using a microphone or portable signal generator, connect to each microphone/line level receptacle throughout the facility.
2. Verify that the receptacle under test appears at the correct input and is operating properly.
3. In a similar manner, check all remote tielines and media related lines for correct wiring and labeling.

I. System Equalization
1. Using a RTA, TEF 20, SYSID, or SMAART, equalize all loudspeaker systems to provide a suitable frequency response as follows:
   a. Speech Reinforcement Systems: flat response from 125 Hz to 2.5 KHz, with 2 dB roll off above.
   b. Program Reproduction Systems: flat response from 65 Hz to 8 KHz, with 2 dB roll off above.
2. Verify system gain and amplifier levels.
3. Provide program levels of at least 85 dB and speech reinforcement levels of at least 70 dB in the seating area without objectionable distortion, buzzes, or rattles.
4. Provide hard copy printouts of the spectral response with the test data.

J. RFI and Parasitic Oscillation
1. With systems operating check to ensure that all systems are free from spurious oscillation and radio frequency interference in the absence of audio signal.

K. Buzzes, Rattles and other Distortions
1. Adjust the system for normal operating level in the space. Apply a slow sine wave sweep from 60 Hz to 3 KHz and listen carefully for buzzes, rattles and other objectionable distortions.
2. Correct the cause of the defect. If the cause is not from the system. Bring the cause to the attention of the GC, indicating cause and suggestive corrective actions.

L. Video Systems Test
1. Projected images and screen must be plumb with respect to ceiling line.

M. Video System Tests. Verify performance of all video equipment, components and systems, as specified herein.
1. Video (signal):
   a. S/N (peak to RMS), unweighted DC to 4.2 MHz: 55 dB minimum.
   b. Crosstalk, unweighted DC to 4.2 MHz: 45 dB minimum.
   c. Frequency Response: Within plus to minus 0.5 dB to 4.2 MHz.

d. Line and Field Tilt: 2% maximum.
e. Differential Gain: 2% maximum.
f. Differential Phase: 2 degrees maximum.
g. Frequency Response: DC to 4.2 MHz within plus or minus 0.5 dB.

N. Video Signal Paths
1. Verify operation from each source device through all switching, amplification and distribution devices.

O. Video Test Report shall include the following:
1. Test Failures and Notices
a. Sink Device EDID Test – Open items or failures shall not be accepted.
b. Cable Length Test – Open items or failures shall not be accepted.
c. HDCP KSV Limitations – Limitations shall not be accepted.
d. Cable Limitations - Limitations shall not be accepted.
e. EDID Limitations - Limitations shall not be accepted.
f. Cable Length Limits exceeded – Failing cables shall not be accepted.
2. Device Model Number, Serial Number, and Firmware Version for main chassis and each input and output card.
3. Device Model Number, Serial Number, and Firmware Version for connected transmitter and receiver devices.
4. EDID – Input Resolution and 3D support status for each input.
5. EDID – Supported Output Resolution and 3D support status for devices connected to each output.
6. EDID – Supported Audio formats for each input.
7. EDID – Supported Audio formats for devices connected to each output.

P. Control Systems
1. Verify operational functions of the control system and all interfaced devices.
2. Verify operational functionality of any wireless user devices.

3.8 CAT5E/CAT6 CABLE CERTIFICATION

A. General Field Test Requirements
1. All CAT5E/CAT6 cabling links installed as part of this scope shall be tested for the following, in accordance with the field test specifications defines in ANSI/TIA-568-C.2 “Commercial Balanced Twisted-Pair Telecommunications Cabling and Components Standard.” This document will be referred to as the “Category 5e Standard”:
a. Wire Map
b. Length
c. Insertion Loss
d. NEXT loss
e. PS NEXT Loss
f. ACR-F Loss
g. PS ACR-F Loss
h. Return Loss
i. Propagation Loss
j. Delay Skew
2. The installed twisted-pair horizontal links shall be tested from terminated end point to terminated end point for compliance with the “Permanent Link” performance specification as defined in the Category 5e Standard.
3. One hundred percent of the installed cabling links must pass the requirements of the Category 5e standard mentioned above and as further detailed in Section B below. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation in accordance with Section C below.
4. The test equipment (tester) shall comply with the accuracy requirements for level IIe field testers as defined in ANSI/TIA-1152. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy plus adapter contribution) are specified in Table 2 of ANSI/TIA-1152 (Table 2 in this TIA document also specifies the accuracy requirements for the channel configuration).
5. The RJ45 test plug shall fall within the values specified in ANSI/TIA-568-C Annex C for NEXT, FEXT and Return Loss.
6. The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.

7. The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy, preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.
8. The Pass or Fail condition of the link-under-test is determined by the results of the required individual tests (detailed in Section 4.2.2 of ANSI/TIA-1152). Any Fail result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass.
9. A Pass or Fail result for each parameter is determined by comparing the measured values with the specifies test limits for that parameter.

B. Performance Test Parameters
1. The test parameters are defined by the Category 5e Standard. The test of each link shall contain all of the following parameters as detailed below. In order to pass the test, all measurements (at each frequency in the range from 1 MHz through 100 MHz) must meet or exceed the limit value determined in the above mentioned standard.
2. Wire Map - Shall report Pass if the wiring of each wire-pair from end to end is determined to be correct.
3. Length – The field tester shall be capable of measuring length of all pairs of a basic link or channel based on the propagation delay measurement and the average value for NVP. The physical length of the link shall be calculated using the pair with the shortest electrical delay. This length figure shall be reported and shall be used for making the Pass/Fail decision. The Pass/Fail criteria are based on the maximum length allowed for the Permanent Link configuration (90 meters – 295 feet) plus 10% to allow for the variation and uncertainty of NVP.
4. Insertion Loss (Attenuation) – Insertion Loss is a measure of signal loss in the permanent link or channel. The term “Attenuation” has been used to designate “Insertion Loss.” Insertion Loss shall be tested from 1 MHz through 100 MHz in maximum step size of 1 MHz. It is preferred to measure insertion loss at the same frequency intervals as NEXT loss in order to provide a more accurate calculation of the Attenuation-to-Crosstalk Ratio (ACR) parameter. Minimum test results documentation (summary results): Identify the worst wire pair (1 of 4 possible). The test results of the worst wire pair must show the highest attenuation value measured (worst case), the frequency at which the worst case value occurs, and the test limit value at this frequency.
5. NEXT Loss – Pair-to-pair near end crosstalk loss (abbreviated as NEXT loss) shall be tested for each wire pair combination from each end of the link (a total of 12 pair combinations).This parameter is to be measured from 1 through 100 MHz. NEXT Loss measures the crosstalk disturbance on a wire pair at the end from which the disturbance signal is transmitted (near-end) on the disturbing pair. The maximum step size for NEXT loss measurements shall not exceed the maximum step size defined in the Category 5e Standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst value of NEXT (worst case). NEXT is to be measured from each end of the link-under-test. These wire pair combinations must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.

Table 1 – Maximum frequency step size as defined in ANSI/TIA-1152

Frequency Range (MHz)	Maximum Step size (MHz)
1 - 31.25	0.15
31.26 - 100	0.25

6. PS NEXT Loss – Power Sum NEXT Loss shall be evaluated and reported for each wire pair from both ends of the link under-test (a total of eight results). PS NEXT Loss captures the combined near-end crosstalk effect (statistical) on a wire pair when all other pairs actively transmit signals. Like NEXT this test parameter must be evaluated from 1 through 100 MHz and the step size may not exceed the maximum step size defined in the Category 5e Standard as shown in Table 1. Maximum test results documentation (summary results): Identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for PS next. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
7. ACR-F Loss, pair to pair – Attenuation Crosstalk Ratio Far-end is calculated from the pair-to-pair FEXT Loss. It shall be measured for each wire-pair combination from both ends of the link under-test. FEXT Loss measures the crosstalk disturbance on a wire pair at the opposite end (far-end) from which the transmitter emits the disturbing signal on the disturbing pair. FEXT is measured to

compute ACR-F Loss that must be evaluated and reported in the test results. ACR-F measures the relative strength of the far-end crosstalk disturbance relative to the attenuated signal that arrives at the end of the link. This test yields 24 wire pair combinations. ACR-F is to be measured 1 through 100 MHz and the maximum step size for FEXT loss measurements shall not exceed the maximum step size defined as the standard as in Table 1. Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst value for ACR-F. There wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.

8. PS ACR-F Loss – Power Sum Attenuation Crosstalk Ratio Far-end is a calculated parameter that combines the effect of the FEXT disturbance from three wire pairs of the fourth one. This test yields eight wire-pair combinations. Each wire-pair is evaluated from 1 through 100 MHz in frequency increments that do not exceed the maximum step size defined in the standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst pair combinations must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
9. Return Loss – Return Loss (RL) measures the total energy reflected on each wire pair. Return Loss is to be measured from both ends of the link-under-test for each wire pair. This parameter is also to be measured from 1 through 100 MHz in frequency increments that do not exceed the maximum step size defined in the Category 5e Standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst value of Return Loss. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
10. Propagation Delay – Propagation delay is the time required for the signal to travel from one of the links to the other. This measurement is to be performed for each of the four wire pairs. Minimum test results documentation (summary results): Identify the wire pair with the worst propagation delay. The report shall include the propagation delay value measured as well as the test limit value.
11. Delay Skew – [as defined in the Category 5e Standard; Section 6.2.19] This parameter shows the difference in propagation delay between the four wire pairs. The pair with the shortest propagation delay between the four wire pairs. The pair with the shortest propagation delay is the reference pair with a delay skew value of zero. Minimum test results documentation (summary results): Identify the wire pair with the worst-case propagation delay (the longest propagation delay). The report shall include the delay skew value measured as well as the test limit value.

C. Test Result Documentation
1. The test results/measurements shall be transferred into a Windows based database utility that allows for the maintenance, inspection, and archiving of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered, i.e., “as saved in the tester” at the end of each test and that these results cannot be modified at a later time.
2. The database for the completed job shall be stored and delivered on CD-ROM or DVD including the software tools required to view, inspect, and print any selection of test reports.
3. A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:
   a. The identification of the link in accordance with the naming convention defined in the overall system documentation.
   b. The overall Pass/Fail evaluation of the link-under-test including the NEXT Headroom (overall worst case) number.
   c. The date and time the test results were saved in the memory of the tester.
4. General information to be provided in the electronic data base with the test results information for each link:
   a. The identification of the customer site as specified by the end-user.
   b. The identification of the link in accordance with the naming convention defined in the overall system documentation.
   c. The overall Pass/Fail evaluation of the link-under-test
   d. The name of the test limit selected to execute the stored test results
   e. The cable type and value of NVP used for length calculations
   f. The date and time the test results were saved in the memory of the tester
   g. The brand name, model, and serial number of the tester.
   h. The identification of the tester interface
   i. The revision of the tester software and the revision of the test limits database in the tester
   j. The test results information must contain information on each of the required test parameters that are listed in Section B and as further detailed below under paragraph C5.
5. For each of the frequency-dependent test parameters, the value measured at every frequency during the test is stored. The PC-resident database program must be able to process the stored

results to display and print a color graph of the measured parameters. The PC-resident software must also provide a summary numeric format in which some critical information is provided numerically as defined by the summary results (minimum numeric test results documentation) as outlined above for each of the test parameters.

6. The detailed test results data to be provided in the electronic database must contain the following information:
   a. Length: Identify the wire-pair with the shortest electrical length, the value of the length rounded to the nearest 0.1 m330 and test limit value.
   b. Propagation delay: Identify the pair with the shortest propagation delay, the value measured in nanoseconds (ns) and the test limit value.
   c. Delay Skew: Identify the pair with the largest value for delay skew, the value measured in nanoseconds (ns) and the test limit value.
   d. Insertion Loss (Attenuation): Minimum test results documentation as explained in Section B for the worst pair.
   e. Return Loss: Minimum test results documentation as explained in Section B for the worst pair as measured from each end of the link.
   f. NEXT, ACR-F: Minimum test results documentation as explained in Section B for the worst pair combination as measured from each end of the link.
   g. PS NEXT and PS ACR-F: Minimum test results documentation as explained in Section B for the worst pair combination as measured from each end of the link.

3.9 FINAL OBSERVATION & TESTING

A. Upon completion of installation, initial adjustments, tests and measurements specified in Part 3, and submission and review of the results, a final observation and test will be performed by the Owner or Owner’s representative no earlier than two weeks after receipt of the written results.
B. Provide a minimum of one (1) person for observation and testing familiar with aspects of the System to assist the Owner.
C. The process of testing the System may necessitate moving and adjusting certain components.
D. Testing includes operation of each major system and any other components deemed necessary. Perform tests and provide required test equipment, tools and material required to make any necessary repairs, corrections, or adjustments.
E. The following procedures will be performed on each System:
   1. Observation of the methods and means employed to incorporate the System within the facility.
   2. Verification of proper operation, from controlling devices to controlled devices.
   3. Verification of proper adjustment, balance, and alignment of equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings for each level control, and appropriately record these settings within the Record Documents.
   4. Other tests on equipment or systems deemed appropriate.
F. In the event the need for further adjustment or work becomes evident during testing, the Contractor is to continue their work until the System is acceptable at no addition to the contract price. If approval is delayed because of defective equipment, or failure of equipment or installation to meet the requirements of these specifications and any extension of the observation and testing period is required, the Contractor shall pay for additional time and expenses of the Owner at the standard rate in effect at that time.

3.10 TEST EQUIPMENT

A. Thirty days prior to start of testing, provide a list to the Owner of test equipment make, model numbers and calibration dates that will be used.
B. The following equipment shall be available on site for the entire test period through final system testing.
   1. Sound Level Meter : ANSI S1.4-1971 Type S1A with digital or analog display. Meter to provide ranges of 40 to 120 dBA.
   2. Pink Noise Source - Equal energy per octave bandwidth 20 Hz to 20,000 Hz, ±1 dB (long-term average) at 0 dBm output. Stability: ±2 dB per day.
   3. Dual-trace oscilloscope - 100 MHz bandwidth, 1 mV/cm sensitivity.
   4. Impedance Meter - Capable of testing audio lines at three frequencies, minimum, between 250 Hz and 5k Hz. Measurement Range: 1 ohm to 100 kohms.
   5. Audio Oscillator: bandwidth 20 Hz to 20k Hz ±.5 dB at 0 dBm output. Output to be balanced. Oscillator to include adjustable output level over the range from –30 dBu to +10 dBu.
   6. Multimeter - Measurement range, DC to 20k Hz, 100 mV to 300 V, 10 ma to 10 A, dB.
   7. NTSC Test generator
   8. Real time analyzer with LED or CRT display. The unit shall meet the filter requirements of ANSI S1.11 Class III for one third octave filters.
   9. Video (analog) test generator capable of generating signal up to 1920 x 1200 with audio.

10. Video (digital) test generator capable of generating signal up to 1920 x 1200 with audio.
11. Ladders and scaffolding necessary to inspect elevated equipment, junction boxes, etc.

C. Provide three portable VHF or UHF business band radios for use during acceptance testing with transmission range sufficient to cover entire project. Include rechargeable batteries and recharger along with holster for wearing on belt. Radios to be available for duration of testing process, including any follow-up visits required prior to final acceptance.

3.11 INSTRUCTION OF OWNER PERSONNEL

A. Provide instruction to Owner designated personnel focusing on the use, operation and maintenance of the systems, scheduled as a minimum of two separate sessions, by an instructor fully knowledgeable and qualified in system operation. The System Reference Manuals should be complete and on site at the time of this instruction. Coordinate schedule of demonstration with Owner's Representative.
   1. Auditorium
      a. 4 hours of instruction.
   2. Aux Gym
      a. 4 hours of instruction.
   3. Music Rooms
      a. 5 hours of instruction (Orchestra, Band, Mariachi and Choir).
      b. 2 hours of instruction (Ensemble, Shared Ensemble and Percussion).
   4. Black-Box
      a. 6 hours of instruction.
   5. Theater Classroom
      a. 2 hours of instruction.

B. Video record all training sessions and compile a training video to be provided to the Owner on digitally.

C. Provide sign in sheet to document the attendee's presence.

D. If Contractor is not properly equipped to conduct Owner training on particular equipment, arrange for factory representatives of the equipment to be present to provide training at no additional cost to the Owner.

3.12 CLEANUP AND REPAIR

A. Upon completion of the work, remove refuse and rubbish from and about the premises. Leave areas and equipment clean and in an operational state. Repair any damage caused to the premises by the installation of systems at no cost to the Owner.

END OF SECTION 27 41 16

SECTION 27 51 00 - PUBLIC ADDRESS AND WIRELESS CLOCK SYSTEM

PART 1 – GENERAL

1.1 This section identifies the requirements, technical design, and specifications for the distributed audio communication systems at Fort Bend ISD Willowridge HS, located in Houston City, Texas (“Owner”). The Distributed Audio System as specified is an Industry-Standard and include 2-way intercom and 1-way paging/public address system.

1.2 The existing Telecor XL intercommunications system shall be expanded to accommodate the building additions as noted on the contract drawings.

1.3 The Master Clock system will be expanded to accommodate the building additions as noted on the contract drawings.

1.4 The Contractor shall provide a Manufacturer’s Performance Certification for the installed building wide public address and clock system.

1.5 Contractor shall include materials, equipment, and labor necessary to provide a complete and functional audio system regardless of any items not listed or described in this specification or associated drawings.

1.6 It is strongly recommended that each prospective Contractor perform a site visit to determine any site conditions that may impact the installed system cost prior to submitting a bid. Failure to perform a site visit does not release the Contractor from responsibility for any existing conditions.

1.7 REQUIREMENTS

A. Contractor Experience Requirements

B. Submittal Requirements

C. Acceptable Manufacturers

D. Codes, Standards and Regulations

E. General Requirements

F. System Requirements

G. Testing Requirements

H. Project Closeout Documentation

I. Attachments

1.8 RELATED REQUIREMENTS

A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 1 apply to the work specified in Division 27 and shall be complied with in every respect. The Contractor shall examine all of the items which make up the Contract Documents and shall coordinate them with the work on the project.

B. Contractor Experience Requirements

1. The Contractor shall possess all relevant Manufacturer Certifications (i.e. speakers, gateways, headend equipment, etc.,) for both the company and individual technicians prior to submitting a bid for the work.

2. The Contractor's Project Manager shall be available for all onsite coordination meetings.

3. The Contractor shall have been in business for a minimum of five (5) years.

4. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a 75-mile radius of the project site.

5. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.

6. Certification shall be submitted verifying the Contractor is the manufacturer's authorized Contractor.

7. Certificates of attendance will be submitted for attendance in manufacturer's installation / maintenance training by the Contractor's directly employed personnel.

8. Provide 24-hour support, 7 days a week within 2 hours during normal business day and 4 hours during non-business hours.

C. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

1.9 SUBMITTAL REQUIREMENTS

A. Pre-Installation Submittal

1. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Architect/Design Consultant.

2. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e. product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product certifications for installers, etc.). Submittals not in the proper sequence will not be approved.

3. Manufacturer product data sheets for each proposed system component.

   a. For product data sheets containing more than one (1) part number or product, the Contractor shall clearly identify the specific part number or product being submitted.

4. Manufacturer Product Certifications for Company.

5. Manufacturer Product Certifications for Installers.

6. Manufacturer Certifications for testing equipment technicians.

7. Manufacturer Certifications for testing equipment calibration.

8. Manufacturer Certifications for Contractor's Project Manager and available for all onsite coordination meetings.

9. Manufacturer Warranty letter.

10. Documentation indicating that Contractor has been in business for (5) years.

11. Address of Contractor's local office within a 75-mile radius of the project site.

12. Quantity of full-time local technicians within a 75-mile radius of the project site.

13. List of five (5) contractor-installed projects of a similar size and scope that have been in operation for at least (1) year. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, Brief Description of Project, Client Point of Contact Name and Phone Number.

14. List of completed and ongoing projects with the Owner. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, and Brief Description of Project.

15. Shop drawings of the proposed system installation.

    a. Shop drawings shall include speaker locations, gateway locations and mounting method, cabling diagrams, outlet locations, preliminary cable numbers, proposed cable pathways, system schematics, and riser diagrams. Shop drawings shall be submitted on 30" X 42" bond paper.

    b. Contractor shall maintain a set of shop drawings on site at all times and shall update the shop drawings on a weekly basis. Shop drawings shall be made available for inspection at the request of the Architect/Design Consultant.

16. Itemized list of all equipment, materials and labor required for the installation of the audio system as specified herein.

    a. This list shall be provided in printed and electronic format (Microsoft Excel) and shall contain: Part Number, Description, Unit of Measure, Unit Cost, Quantity, Labor Cost and Extended Cost to provide a complete and functional audio-visual system.

B. Project Closeout Submittal

1. The Contractor shall provide three (3) sets of comprehensive drawings accurately depicting the "as-built" condition Public Address and Clock Systems as they were installed to the Owner/Consultant at the time of substantial completion. Final payment will not be made until these as-built documents are received and approved by the Owner/Consultant.

    a. As-built drawings must be provided in original hardcopy format and on a CD-ROM and/or delivered electronically in AutoCAD rel. 2010 or higher.

2. Documentation shall include but not be limited to:

    a. Equipment O & M manuals

    b. Installed equipment list (manufacturer model numbers, serial numbers, installed locations, etc.)

    c. Configuration information in Microsoft Excel format (IP addresses, Passwords and Usernames etc.)

    d. Warranty support information

    e. Documentation shall be bound, sectioned and tabbed in the following order (when applicable):

        1) Equipment O&M Manuals (Bound Separately)

        2) Installed Equipment List

        3) Configuration Information

        4) Warranty Support Information

3. The Contractor shall provide three (3) sets of test documentation for the Public Address and Clock Systems to the Architect/Design Consultant at the time of final systems acceptance. Test results shall be provided in original hardcopy format and on a CD-ROM. Final payment will not be made until these test results are received and approved by the Architect/Design Consultant.

4. The Contractor shall furnish the original Certificate of Warranty to the Architect/Design Consultant at the time of final systems acceptance. Final payment will not be made until this Certificate of Warranty is received and approved by the Architect/Design Consultant.

C. Contractor shall provide warranty information to include the name, address and phone number contacts for warranty call outs. Final payment will not be made until this warranty information is received and approved by the Architect/Design Consultant

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The following sections specifically list the acceptable equipment types and items for this project.

B. Architect/Design Consultant will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.

C. Proposed equivalent items must be approved in writing by the Architect/Design Consultant prior to submitting a bid. Proposed equivalent items must meet or exceed these specifications and the specifications of the specified item.

D. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall substitute the appropriate equivalent manufacturer's part number.

E. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished.

F. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.

G. All wiring, equipment, and installation materials shall be new and of the highest quality.

H. Labels on all wiring, materials, and equipment must indicate a nationally recognized testing laboratory.

I. Original Equipment Manufacturer (OEM) documentation must be provided to the Architect/Design Consultant which certifies performance characteristics and compliance with industry standards.

2.2 Acceptable Manufacturers

A. Public Address System

1. The following equipment shall be used as a basis of design for the Public Address System. Equivalent systems and/or components from the manufacturers Rauland, Bogen and TeleCor are also acceptable.
   a. Provide 2-way communications to every interior occupied space. Exterior spaces do not require 2-way communication.

B. Public Address System Cabinet

1. Telecor XL Card Cage Unit
   a. CCU-XL

2. Telecor XL Central Processing Unit
   a. CPU-3-XL-MA

3. Telecor XL Audio Buffer Unit
   a. ABU-3A-MA

4. Telecor XL Console Port
   a. CCP-300-MA

5. Telecor XL Power Supply Unit
   a. PSU-2

6. Telecor XL Audio Termination Panel

a. ATP-AX2

C. Power Amplifiers

1. Telecor XL - Tel 60
2. Telecor XL - Tel 125
3. Telecor XL - Tel 250

D. Speaker Input/Output Board

1. Telecor XL – IOP-2

E. Telephone Integration Board

1. Telecor XL - PBI-6-MA

F. Serial Connection Board

1. Telecor XL RS232 – Data I/O Board

G. Administrative Control Console

1. Telecor XL MCC-300

H. Administrative Console Program Source:

1. Tascam CD-200IL

I. Wall Jack for Master Control Console

1. Standard telephone line cord and wall jack

J. Remote Clock Driver

1. Telecor XL RCD-7-XL-MA

K. Administrative Paging Microphone

1. TOA – PM660U

L. Attenuators

1. Atlas – AT- 35 (Private Offices)
2. J.W. Davis Brand – AT-40S (Remote Volume Control)

M. 66 Block – Siemens Model# *Determined by Contractor*

1. Provide 66 style punch-down blocks (matching existing equipment) to support the number of stations in the expansion required.

2. Provide 25 pair cabling with Amphenol connectors to support the number of stations in the expansion required.

N. Cable Management

1. Rear Rack Rails

a. Provide and install compatible Middle Atlantic rear rack rails for the existing rack/cabinet that houses the PA headend equipment.

2. Cable Lacing Bars

a. Provide and install compatible Middle Atlantic cable lacing bars to secure the existing and new 25-Pair cables.

b. One lacing bar shall be installed behind each termination card.

c. Existing cabling shall not be disconnected from head end cards

d. 25-Pair cables shall be fastened to lacing bars around entire 25-Pair cable jacketed assembly. Do not fasten individual wires/pairs to lacing bars.

O. Paging/Intercom Call Button:

1. Call Station (QTY PER PLAN)

a. Approved Equivalent.

P. Loudspeakers:

1. Quam –
   a. Classrooms and instructional spaces - System12/VC (Lay in ceilings)

   b. Administrative offices and conference rooms – System12

2. Atlas APF-15T (Interior/Exterior - Recessed)
   a. Include the following:

      1) Atlas 161RES Recessed Backbox

      2) VP161A-APF

3. Toa PE-304 (Open Ceilings)

4. Liberty 4-Conductor, Plenum-Rated, Shielded Cable – Part Number 22-4C-PSH

5. Or Equivalent

Q. Pathway Wire Support

1. Panduit J-Mod Cable Support System

2. Erico – CADDY CAT LINKS J-Hook Series

3. Panduit Plenum Rated Hook & Loop (Black)

R. Clock System
1. Match Existing field devices

PART 3 – EXECUTION

3.1 CODES, STANDARDS, REGULATIONS

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

1. ASTM B 1 Standard Specification for Hard-Drawn Copper Wire
2. ASTM B 8 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
3. ASTM D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
4. ASTM D 709 Laminated Thermosetting Materials

C. Alliance for Telecommunications Industry Solutions (ATIS)

D. Building Industry Consulting Service International (BICSI)

1. Telecommunications Distribution Methods Manual 15th Edition
2. Outside Plant Design Reference Manual 6th Edition
3. ANSI/BICSI 002, Data Center Design and Implementation Best Practices
4. NECA/BICSI 568 – Standard for Installing Commercial Building Telecommunications Cabling
5. NECA/BICSI 607, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

E. Electronics Industry Alliance (EIA)

F. Federal Communications Commission (FCC)

1. FCC Part 15, Radiated Emissions Limits,
2. FCC Part 68, Connection of Terminal Equipment to the Telephone Network,
3. FCC Part 76, Cable Television Service,

G. Insulated Cable Engineers Association (ICEA)

1. ICEA S-87-640 Fiber Optic Outside Plant Communications Cable
2. ICEA S-98-688 Broadband Twisted Pair, Telecommunications Cable Aircore, Polyolefin Insulated Copper Conductors
3. ICEA S-99-689 Broadband Twisted Pair Telecommunications Cable Filled, Polyolefin Insulated Copper Conductors

H. International Electrotechnical Commission (IEC)

I. Institute of Electrical and Electronics Engineers, Inc. (IEEE)

1. IEEE Standard 81, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System

2. IEEE Standard 1100, Recommended for practice for Powering and Grounding Sensitive

3. Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)

4. IEEE C2 National Electrical Safety Code

5. IEEE Std 100 The Authoritative Dictionary of IEEE Standards Terms

J. International Organization for Standardization (ISO)

1. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)

2. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises

3. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration

4. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises

5. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration

K. National Cable Television Association (NCTA)

L. National Electrical Manufacturers Association (NEMA)

1. NEMA C62.61 Gas Tube Surge Arresters on Wire Line Telephone Circuits

M. National Fire Protection Association (NFPA)

1. NFPA-70, National Electrical Code

2. NFPA-75, Protection of Electronic Computer Data Processing Equipment.

3. NFPA-101, Life Safety Code

4. NFPA-297, Guide on Principles and Practices for Telecommunications Systems

5. NFPA-780, Standard for the Installation of Lightning Protection Systems.

N. National Institute Standards and Technology (NIST)

O. Occupational Safety and Health Administration (OSHA)

P. Telecommunications Industry Association (TIA)

1. ANSI/TIA-568.0-D-1, Generic Telecommunications Cabling for Customer Premises.

2. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard.

3. ANSI/TIA -568.0-D.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard.

4. ANSI/TIA-568.3-D-1, Optical Fiber Cabling Components Standard.

5. ANSI/TIA–569-E Commercial Building Standard for Telecommunications Pathways and Spaces.

6. ANSI/TIA-606-C, Administration Standard for the Telecommunications Infrastructure.

7. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.

8. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.

Q. U.S. Department of Agriculture (USDA)

1. RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment and Construction

2. RUS Bull 1751F-643 Underground Plant Design

3. RUS Bull 1751F-815 Electrical Protection of Outside Plant

4. RUS Bull 1753F-201 Acceptance Tests of Telecommunications Plant (PC-4)

5. RUS Bull 1753F-401 Splicing Copper and Fiber Optic Cables (PC-2)

6. RUS Bull 345-65 Shield Bonding Connectors (PE-65)

7. RUS Bull 345-72 Filled Splice Closures (PE-74)

8. RUS Bull 345-83 Gas Tube Surge Arrestors (PE-80)

R. Underwriters Laboratories, Inc. (UL)

1. UL 510 Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape

2. UL 910 Applicable Flame Test

3.2 In the event of any conflicts between documents referenced herein and the contents of this specification, the Contractor shall notify the Architect/Design Consultant in writing of any such occurrences before purchasing or installing any equipment or materials. The Architect/Design Consultant will notify the Contractor of any actions required to resolve these conflicts. Such actions may include but are not limited to design changes, equipment, materials and/or installation changes. In any event Contractor shall not supersede specifications and standards from the latest NFPA and NEC publications. In the event of any conflicts between Standards and Codes the more stringent shall take precedence.

3.3 The Contractor shall assist the Audio-Visual Systems contractor in connecting the PA/Intercom system to the classroom audio visual systems in each classroom. This connection will allow for page override ducking of the classroom Audio Visual System

3.4 GENERAL REQUIREMENTS

A. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), State of Texas, the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the aforementioned laws, ordinances, and rules, the matter shall be referred to the Architect/Design Consultant for direction before proceeding with that part of the work.

B. The Contractor shall be responsible for coordination with other trades to ensure any conflicts or potential conflicts are resolved prior to any work beginning on the project.

C. The Contractor shall install the materials in accordance with these specification and the manufacturer’s installation guidelines.

D. No deviations from the plans or specifications shall be made without full consent in writing of the Architect/Design Consultant. The Contractor shall have written approval from the Architect/Design Consultant for any additional work beyond the Contract Documents prior to beginning such work. If the Contractor does not obtain written approval from the Architect/Design Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.

E. The Contractor shall obtain written permission from the Architect/Design Consultant before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to girders, beams, floors, walls, roofs, or ceilings.

F. Contractor shall notify the Architect/Design Consultant a minimum of (2) weeks prior to beginning work and will participate in a pre-construction meeting with the Architect/Design Consultant to perform a walkthrough, review the scope of work, schedule, and escalation procedures.

G. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap wire, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.

H. Equipment and materials installed by the Contractor shall be free of defects and damage.

I. Contractor shall be responsible for the repair of any damage caused by the contractor during the installation.

J. Contractor shall test all equipment prior to installation. By failing to perform this testing operation, the Contractor shall accept the equipment as compliant and assume all liability for the replacement of equipment at no cost to the Owner should it be found defective at a later date.

K. Contractor shall maintain a set of working specifications, design drawings, and shop drawings to be kept on site at all times and shall update the shop drawings on a weekly basis. Shop drawings shall be made available for inspection at the request of the Architect/Design Consultant.

L. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.

M. Equipment and materials shall be delivered and stored in accordance with the manufacturer's guidelines at the Contractor's expense.

N. Contractor shall make all stored equipment and materials available for inspection at the request of the Architect/Design Consultant.

O. All equipment and material used in the installation shall be approved by the manufacturer for the environment in which it is being installed.

P. Cables shall be properly supported in accordance with industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.

Q. Contractor shall be responsible to properly protect equipment from damage by other trades during construction.

R. Cables shall be routed at 90-degree angles to the building structure. At no time shall a diagonal pull be installed.

S. The Contractor shall not install cables in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be removed and replaced at no cost to the Owner.

3.5 SYSTEM REQUIREMENTS

A. Quantities listed are for reference only, contractor is responsible for furnishing materials as required to provide a complete and functioning system. Where quantities are not noted, they may be obtained from the drawings. In the event of a discrepancy between the specifications and the drawings, the greater quantity shall be furnished.

B. Networked Controller:

1. Contractor shall furnish and install the networked controller(s) as indicated on the technology drawings and associated equipment schedules and diagrams.

2. Contractor shall provide installation in accordance with Manufacturer's installation instructions.

3. Contractor shall coordinate exact location/placement to ensure all spaces are coordinated with other trades sharing the spaces.

4. Contractor shall load the latest firmware updates on all equipment and components.

5. Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.

6. Contractor shall work with the district to implement the proper bell schedule for the facility.

7. Contractor shall work with the owner to ensure each piece is properly configured and fully operational. Upon completion, the equipment shall be clean and left in perfect operating condition.

C. Switching Security Card(s)

1. Contractor shall furnish and install the switching security card(s) as indicated on the technology drawings and associated equipment schedules and diagrams.

2. Contractor shall provide installation in accordance with Manufacturer's installation instructions.

3. Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.

4. Contractor shall provide final adjustments. Upon completion, the equipment shall be clean, adjusted and left in perfect operating condition.

D. Wall-Mounted Shelf:

1. Contractor shall furnish and install the shelf as indicated on the technology drawings and associated equipment schedules and diagrams.

2. Contractor shall provide installation in accordance with Manufacturer's installation instructions.

3. Upon completion the contractor shall ensure the equipment is clean, level, properly anchored and left in perfect operating condition.

E. UPS / Battery Backup for Paging System:

1. Contractor shall furnish and install the UPS size to support the system for 15 minutes and backup power

2. Contractor shall provide installation in accordance with Manufacturer's installation instructions.

3. Contractor shall load the latest firmware updates on all equipment and components.

4. Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines.

5. Contractor shall provide final adjustments. Upon completion, the equipment shall be clean, adjusted and left in perfect operating condition.

F. Loudspeakers

1. Contractor shall furnish and install the loudspeakers as indicated on the technology drawings, and associated equipment schedules and diagrams.

a. Drop-Tile, Ceiling-Mounted talkback Paging Loudspeaker (Typical Classrooms):

b. Drop-Tile, Ceiling-Mounted Paging Loudspeaker (Typical Offices/Hallway/Etc.):

c. Surface-Mounted Paging Loudspeaker – Indoor (Locations Without Accessible Ceiling):

d. Surface-Mounted Horn Paging Loudspeaker – Outdoor:

2. Contractor shall furnish installation in accordance with Manufacturer's installation instructions.

3. Contractor shall energize and commission equipment in accordance with manufacturer instructions.

4. Contractor shall work with the owner to ensure each speaker is properly configured and fully operational.

5. Contractor shall adjust the volume levels on each speaker to the satisfaction of the Owner.

6. Upon completion, the equipment shall be clean and left in perfect operating condition

G. Bridges / Backboxes and Cages

1. Contractor shall furnish and install bridges and backboxes in all drop-tile locations as indicated on the technology drawings.

2. Contractor shall furnish and install cages on wall speakers in areas where damage is likely (such as gymnasiums) as indicated on the technology drawings.

3. Contractor shall furnish installation in accordance with Manufacturer's installation instructions.

4. Upon completion, the equipment shall be clean and left in perfect operating condition

H. Paging System Cabling

1. Contractor shall furnish and install the cabling as indicated on the technology drawings, and associated equipment schedules and diagrams.

2. Contractor shall furnish installation in accordance with Manufacturer's installation instructions.

3. Contractor shall energize and commission equipment in accordance with manufacturer instructions.

4. Contractor shall provide final adjustments to the system. Upon completion, the system shall be clean, adjusted and left in perfect operating condition.

I. Cable Support

1. All cables shall be installed and supported in conduit systems, cable trays, cores, sleeves, etc. as indicated in the technology drawings.

2. When cables leave the main pathway systems as indicated on the technology drawings, they shall be installed and supported in Contractor furnished and installed j-hooks or saddle straps.

3. No cable pathway shall exceed 40% fill ratio.

4. The contractor shall furnish a separate j-hook or saddle strap pathway for each cable type (data, voice, video and security).

5. J-hooks and saddle straps shall be installed no more than five-feet (5') apart on center, using only manufacturer-approved installation methods and hardware.

6. J-hooks shall be furnished with closure clips.

7. Maximum sag between supports shall not exceed twelve-inches (12”).

8. Contractor shall establish j-hook and saddle strap pathways and shall coordinate pathways with all other disciplines. Under no-circumstances shall these pathways be used to support other low-voltage applications not included in this specification.

9. Cable Dressing

   a. No nylon cable ties shall be used at any time during the installation of the cable.

   b. Above Ceiling

      1) Contractor shall furnish and install plenum-rated hook & loop straps in plenum-rated airspaces.

         a) The Contractor shall install no more than (1) hook & loop strap between each j-hook or saddle strap or at service loop locations.

   c. Equipment Rooms / Telecommunications Rooms

      1) The Contractor shall bundle all visible cables with Contractor furnished and installed hook & loop straps.

         a) Hook & loop straps shall be installed twenty-four (24) inches apart on center.

J. Administrative Handsets

1. Each dialing administrative telephone in the system shall be programmable for the following options:

   a. Allow zone paging

   b. Allow paging of individual rooms

   c. Allow All-Page announcements

   d. Allow Executive Override

   e. Allow Emergency Paging

   f. All activation of Time Zone tones

   g. Set the priority level and target display or “normal” calls

   h. Set the priority level and target display of “emergency” calls

   i. Assignment of architectural number

   j. Class of service

   k. Assignment of associated speaker to paging zone

   l. Automatic Call-Back Busy

   m. Call Forward-No Answer

   n. Call Forward-Busy

K. Zoning

1. Zoning shall be coordinated with Fort Bend ISD and consultant for PA system expansion. Zoning of speakers will integrate into the existing zones and provide the room to room paging as noted above

   a. One zone for inside classroom

   b. One zone for gymnasium speakers

c. One zone for cafeteria speakers

d. One zone for common area speakers

e. One zone for administration areas

f. One zone for teacher's lounge and workrooms

g. One zone for outside speakers

2. PA is programmed so that it can page individual rooms in the building as well as page by zones. Provide 2-way communications to every interior occupied space. Exterior spaces do not require 2-way communication.

L. Public Address System Integration with Classroom Audio Visual Systems

1. Classroom Audio Visual systems shall be installed and configured to mute program audio during paging events. This functionality requires coordination between the Public Address System Contractor (275100) and the Audio-Visual Systems Contractor (274100).

2. The Public Address System Contractor shall provide and install cabling from the classroom Public Address speaker to the equipment enclosure/amplifier location. This cable shall be terminated and connected to the AV system by the Audio-Visual Systems Contractor. The Public Address System Contractor shall work with the Audio-Visual systems Contractor to ensure that the interconnection and associated functionality are fully tested and operational.

M. Public Address System Integration with Phone System

1. Provide a programmable and addressable system to every occupied space and to the exterior of the building.

2. Provide 2-way communications to every interior occupied space. Exterior spaces do not require 2-way communication.

3. Provide activation of security monitoring functions on a per room basis and per zone basis. Amplified two-way voice communications shall be available from any dial phone in the system, through any speaker in the system. This shall allow hands-free communication to any classroom or any individual loudspeaker unit. A programmable pre-announce tone shall sound immediately before the intercom path is open and a supervisory tone shall sound at regular intervals when speaker monitoring is active.

4. The public address system shall provide for bell changes and shall be capable of storing events, schedules, programmable holidays, bells silenced, etc.

5. Provide for integration with the synchronized wireless clock system.

6. Provide for integration with the audio | visual systems allowing for "Priority Page Override" capability.

7. Provide data network cables as required for network connectivity.
   a. Installed per DIV. 27 cabling specifications.

8. The public address system shall be provided with a UPS with a (60) minute capacity.

9. The public address system shall be connected to the emergency generator, when available.

10. The public address system must integrate with the Fort Bend ISD Cisco VoIP phone system.

    a. An FXO interface will not be accepted.

    b. A SIP interface the public address system manufacturer certifies will work with the Cisco Call Manager 12.0 is preferred. If a SIP interface is not available, provide a Viking RAD-1A, a Cisco ATA190 and an analog phone for testing.

        1) Fort Bend ISD will configure the ATA190 on the Cisco Call Manager.

        2) The Contractor will configure the Viking RAD-1A and make the interconnection between the network switch, Cisco ATA190, Viking RAD-1A and Public Address System.

11. Provide for the increase of stations by 25 percent above those required for the initial design without adding any internal or external components.

3.6

3.7 Training

A. Distributed Audio Communication Systems Training

1. Contractor shall provide a proposed training schedule to the Architect/Design Consultant prior to substantial completion.

2. Contractor shall provide a proposed training syllabus for both administrative users and end-users prior to substantial completion.

3. Training shall include all aspects of the Audio/Visual System as specified and installed. Contractor shall include provisions within the total cost proposal for a minimum of one (1) System Administrator training session. It is anticipated this training will cover advanced functions of the system, basic trouble-shooting techniques and other subject matter pertinent to the on-going support of the A|V systems at the installed facility including bell schedule.

4. Contractor shall include provisions with the total cost proposal for a minimum of two (2) End-User training sessions. It is anticipate this training will cover basic function and operation of the system by faculty. This would include event display management, source control and general systems operation for all installed systems.

3.8 Testing Requirements

A. Distributed Audio Communication Systems Testing

1. Contractor shall un-pack and pre-test equipment prior to installation into the production environment. All configurations shall be re-verified prior to the units being placed into service.

2. Contractor shall test and commission each component per the specifications and manufacture’s installation instructions.

3. Contractor shall test and verify for full operational and network support control functionalities and connections per the specifications and manufacturer’s installation instructions.

4. All network devices shall be verified for link and auto negotiation to the highest connection rate.

5. Contractor shall test and verify all audio functionalities as installed per the specifications and manufacturer’s installation instructions.

6. Contractor shall test and verify all audio functionalities of existing audio equipment for functionality.

7. Bell schedule to comply with district’s bell schedule.

3.9 Project Closeout Documentation

A. As-Built Drawings

1. Drawings shall be provided to the Architect/Design Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Architect/Design Consultant.

2. Three (3) sets of drawings depicting the condition of the audio-visual system as installed.

3. As-Built drawings shall be produced in AutoCAD 2010 or higher and provided in hardcopy and electronically in .dwg and PDF format.

4. Hardcopy drawings shall be provided in the original size as issued by the Architect/Design Consultant.

5. Drawings shall retain the formatting and title block of the original drawings as issued by the Architect/Design Consultant.

6. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of all projectors, projector mounts, projection screens, wall elevations, cable tray, sleeves, pathways, workstation locations, and labeling scheme.

B. Contactor's Statement of Warranty

1. Statement of warranty shall be provided to the Architect/Design Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Architect/Design Consultant.

2. Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor and workmanship starting at final system acceptance.

3. One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e. Contractor name, Point of Contact, address, phone number and

END OF SECTION 27 51 00

SECTION 28 00 00 - COMMON ELECTRONIC SAFETY AND SECURITY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A The requirements contained in this Section apply to all Sections of this Division.

1.2 SUMMARY

A This section includes general design requirements, administration topics, and installation for electronic safety and security systems.

B Refer to section 28 05 10 - Scope of the Electronic Safety and Security Work for a description of project scope.

C Section Includes:

1. Common terminology and requirements used throughout this Division.
2. Identification and labeling.
3. Firestop systems.
4. Sleeves for raceways and cables.
5. Grout.

1.3 STRUCTURED CABLING SYSTEM SCOPE OF WORK

A Refer to Division 27 Sections for more information on the low-voltage structured cabling system infrastructure required for this project.

B Cable infrastructure project requires a [SC Mfr] structured cable system backed by the manufacturer's system warranty as specified.

1.4 DEFINITIONS

AHJ: Authority(ies) Having Jurisdiction.

Architect: The Architect of Record for the project, if any.

Business Day: Monday thru Friday, excluding Holidays recognized by Federal, State and Local government.

CFCI: Contractor Furnished, Contractor Installed

Contract Documents: All documents pertinent to the quality and quantity of all work to be performed on the project. Includes, but not limited to, plans, specifications, addenda, instructions to bidders (both General and Sub-Contractors), unit prices, change orders, architect’s supplemental instructions, etc.

Contractor: The General Contractor and/or Construction Manager, and any contractor or subcontractor performing any low-voltage communications work in the project, whether proposing/working independently or subcontracted under the.

Engineer: The Consulting Mechanical-Electrical Engineers either consulting to the Owner, Architect, other Engineers, etc.

Furnish: Deliver to the site in good condition.

Install: Install equipment furnished by others in complete working order.

(Installed) In EMT/IMC/RMC: Wire and/or cable so identified shall be installed enclosed in the specified type of electrical conduit, subject to the requirements of applicable article(s) of NFPA 70.

OFCI: Owner Furnished, Contractor Installed

OFOI: Owner Furnished, Owner Installed

Provide: Furnish and install in complete working order.

1.5 GENERAL

A The Instructions to Bidders, General and Special Conditions, and all other contract documents shall apply to the Contractor's work as well as to each of his Sub-Contractor's work. Each Contractor is directed to familiarize himself in detail with all documents pertinent to this Contract. In case of conflict between these General Provisions and the General and/or Special Conditions, the affected Contractor shall contact the Engineer for clarification and final determination.

B Each Contractor shall be governed by any alternates, unit prices and addenda or other contract documents insofar as may affect the work or services.

C The work included in this division consists of the furnishing of all labor, equipment, transportation, supplies, material and appurtenances and performing all operations necessary for the satisfactory installation of the complete and operating Electronic Safety and Security System(s) indicated and/or specified in the Contract Documents.

D Any materials, labor, equipment or services not mentioned specifically herein which may be necessary to complete or perfect any part of the Electronic Safety and Security Systems in a substantial manner, in compliance with the requirements stated, implied or intended in the drawings and/or specifications, shall be included as part of this Contract.

E The Contractor shall give written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted a minimum of ten days prior to bid. In the absence of such written notice and by the act of submitting his bid, it shall be understood that the Contractor has included the cost of all required items in his bid, and that he will be responsible for the approved satisfactory functioning of the entire system without extra compensation.

F It is not the intent of this section of the specifications (or the remainder of the contract documents) to make any specific Contractor, other than the Contractor holding the prime agreement, responsible to the Owner, Architect and Engineer. All transactions such as submittal of shop drawings, claims for extra costs, requests for equipment or materials substitution, shall be routed through the Contractor to the Architect (if applicable), then to the Engineer.

G This section of the Specifications or the arrangement of the Contract Documents shall not be construed as an attempt to arbitrarily assign responsibility of work, material, equipment or services to a particular Contractor or Sub-Contractor. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be the responsibility of the Contractor holding the prime contract.

H It is the intent of this Contract to deliver to the Owner a new and complete project once work is complete. Although plans and specifications are complete to the extent possible, it shall be the responsibility of the Contractors involved to remove and/or relocate or re-attach any existing or new systems which interfere with new equipment or materials required for the complete installation without additional cost to the Owner.

I In general, and to the extent possible, all work shall be accomplished without interruption of facility operations. The Contractor shall advise the Architect, Owner and Engineer in writing at least one week prior to the deliberate interruption of any services. The Owner shall be advised of the exact time that interruption will occur and the length of time the interruption will last. Failure to comply with this requirement may result in complete work stoppage by the Contractors involved until a complete schedule of interruptions can be developed.

J Whenever utilities are interrupted, either deliberately or accidentally, the Contractor shall work continuously to restore said service. The Contractor shall provide tools, materials, skilled journeymen of his own and other trades as necessary, premium time as needed and coordination with all applicable utilities, including payment of utility company charges (if any), all without requests for extra compensation to the Owner, except where otherwise provided for in the contract for the work.

K Contractor shall not proceed with changes to scope of work and/or substitutions of specified materials without a signed approval by the Owner. Owner reserves the right to refuse payment for work appurtenant to changes and/or substitutions where such work was performed without signed approval. Refer to Division 01 specifications for detailed change and substitution procedures.

1.6 DRAWINGS AND SPECIFICATIONS

A The Drawings are diagrammatic only and indicate the general arrangement of the systems and are to be followed insofar as possible. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Engineer for approval before proceeding with the work.

B The Drawings and Specifications are intended to supplement each other. No Contractor shall take advantage of conflict between them, or between parts of either. This also includes potential conflicts with regards to equipment and material model numbers, part numbers, etc. and respective description and/or performance. Should this condition exist, the Contractor shall request a clarification not less than 10 days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event that such a condition arises after work is started, the interpretation of the Engineer shall be the determining factor. In all instances, unless modified in writing and agreed upon by all parties thereto, the Contract to accomplish the work shall be binding on the affected Contractor.

C The Drawings and Specifications shall be considered to be cooperative and complimentary and anything appearing in the specifications which may not be indicated on the drawings or conversely, shall be considered as part of the Contract and must be executed the same as though indicated by both.

D Contractor shall make all necessary and required measurements in the field and shall be responsible for correct fitting. The work shall be coordinated with all other branches of work in such a manner as to cause a minimum of conflict or delay.

E The Engineer shall reserve the right to make adjustments in location of conduit, j-hooks, devices, etc. where such adjustments are in the interest of concealing work or presenting a better appearance. Unless a formal proposal request is issued, this work shall be performed without additional cost to the Owner.

F Each Contractor shall evaluate ceiling heights called for on Architectural Plans. Where the location of Communications equipment may interfere with ceiling heights, the Contractor shall call this to the attention of the Engineer in writing prior to making the installation. Any such changes shall be anticipated and requested sufficiently in advance so as to not cause extra work on the part of the Contractor or unduly delay the work.

G Should conflict or overlap (duplication) of work between the various trades become evident, this shall be called to the attention of the Engineer. In such event neither trade shall assume to be relieved of the work which is specified under his branch until instructions in writing are received from the Engineer.

H The Drawings are intended to show the approximate locations of equipment, materials, devices, etc. Dimensions given in figures on the drawings shall take precedence over scaled dimensions and all dimensions, whether given in figures or scaled, shall be verified in the field to ensure no conflict with other work. In case of conflict between small and large scale drawings, the larger scale drawings shall take precedence.

I Where on the Drawings a portion of the work is drawn out and the remainder is indicated in outline, or not indicated at all, the parts drawn out shall apply to all other like portions of the work. Where ornamentation or other detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts of the work, unless otherwise indicated.

J Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work without additional cost to the Owner, the same as if herein specified or indicated.

K Where on the Drawings or Addenda the word typical is used, it shall mean that the work method or means indicated as typical shall be repeated in and each time it occurs whether indicated or not.

1.7 SUBSTITUTION PROCEDURES

A Comply with provisions of Division 01 Section “Substitution Procedures”.

B Substitution may be considered when a product becomes unavailable through no fault of the Contractor.

C If an alternate material is proposed that is equal to or exceeds specified requirements, Contractor shall provide manufacturers’ specifications in writing for Owner approval prior to purchase and installation.

D Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

E Substitutions of material by the Contractor shall be in writing complete with written manufacturers’ specifications. The material substituted shall not void, alter or change manufacturers’ system warranties.

F Substitutions will not be considered when they are indicated or implied on submittals without separate written request or when acceptance will require revision to the Contract Documents.

G The Owner will be the final judge of acceptability, with review by Engineer and the distribution of the acceptance by the Architect.
1. No substitute shall be ordered, installed or utilized without the Architect’s prior written verification of acceptance from the Owner.

1.8 QUALITY ASSURANCE

A Regulatory Requirements
1. Contractor shall supply all city, county, and state permits required by Authorit(ies) Having Jurisdiction.
2. Contractor shall be state-licensed and/or bonded as required for installation of the system(s) Contractor proposes to install.

B Certifications
1. Contractor shall submit an up-to-date and valid certification verifying qualifications of the Contractor and installers to perform the work specified herein at time of bid submission.
2. Contractor shall have a complete working knowledge of electronic safety & security systems cabling applications such as, but not limited to data, voice and video network systems.
3. Contractor shall provide certificates for the appropriate insurance coverage as defined in contract documents.
4. Contractor shall submit evidence of compliance with these requirements prior to beginning work on the project.
5. Cabling installers shall be trained and certified by the cable manufacturer for telecommunication cabling installations and maintenance of said materials.
6. Maintain current status with the warranting manufacturer, including all training requirements, for the duration of the project. Staff each installation crew with the appropriate number of trained personnel, in accordance with their manufacturer/warranty contract agreement, to support the specified system warranty requirements. After installation, submit all documentation to support system warrant(ies) in accordance with the manufacturer’s warranty requirements, and to apply for said warrant(ies) on behalf of the customer.

C Administrative Requirements and Coordination requirements
1. Coordinate work of this section with Owner’s telephone system specifications, workstations, equipment suppliers, and installers.
2. Coordinate installation work with other crafts (examples include ceiling grid contractors, HVAC and sheet metal contractors, etc) to resolve procedures and installation placement for cable trays and cable bundle pathways.

a. The goal of this coordination will be to establish priority pathways for critical data/voice network cable infrastructure, materials, associated hardware, as well as mitigate delays to the project and to allow service access for communications and HVAC components.
b. Damage by Contractor to the craft work of others will be remedied at the Contractor's expense in a timely manner.

3. Exchange information and agree on details of equipment arrangements and installation interfaces.
   a. Record agreements reached in meetings and distribute record to other participants, Owner and telecommunication consultant.
4. Adjust arrangement and locations of distribution frames, patch panels, and cross-connect blocks in equipment rooms and racks to accommodate and optimize arrangement and space requirements of any service provider equipment, telephone system, and LAN equipment.
   a. Tasks shall be coordinated with Owner or his representative, and other trades' installation representatives.
5. When requested by Owner or Owner's representative, furnish extra materials that match specified products and that are factory packaged with protective covering for storage and identified with labels describing contents.

D Common Requirements for Material Quality: Materials, equipment and devices shall be new and of the quality specified and shall be free from defects at the time of installation. Materials, equipment and devices damaged in shipment or otherwise damaged or found defective prior to acceptance by the Owner shall be replaced with new materials, equipment or devices identical with those damaged, unless approved otherwise by the Owner in writing.

E Common Requirements for Code Compliance: In case where differences occur between building codes, state laws, local ordinances, industry standards, utility company regulations and the Contract Documents, the most stringent shall govern. Perform the following:
1. Promptly notify the Engineer in writing of any such difference.
2. Obtain approval from Engineer before proceeding with the Work.
3. Should the Contractor perform any work that knowingly does not comply with local codes, laws and ordinances, industry standards, or other governing regulations; the Work shall be corrected at no cost to the Owner.

F Common Requirements for Compliance with AHJ Instructions: In cases where the Authority Having Jurisdiction requires deviations from the requirements of the Contract Documents, perform the following:
1. Promptly notify the Architect in writing of any such difference.
2. Obtain approval from Architect before proceeding with the Work.

1.9 DELIVERY, STORAGE, AND HANDLING

A Coordination with delivery companies, drivers, site address, and contact person(s) will be the responsibility of the Contractor.

B Contractor requirements:
1. Be responsible for prompt material deliveries to meet contracted completion date.
2. Coordinate deliveries and submittals with the General Contractor to ensure a timely installation.
3. No equipment materials shall be delivered to the job site more than three weeks prior to the commencement of its installation.
4. Equipment shall be delivered in original packages with labels intact and identification clearly marked.
5. Equipment shall not be damaged in any way and shall comply with manufacturer's operating specifications.
6. Equipment and components shall be protected from the weather, humidity, temperature variations, dirt, dust, or other contaminants.
   a. Equipment damaged prior to system acceptance shall be replaced at no cost to the Owner.
7. Contractor shall be responsible for all handling and control of equipment. Contractor is liable for any material loss due to delivery and storage problems.

C Owner/General Contractor shall supply a list of security requirements for Contractor to follow.

1.10 PROJECT/SITE CONDITIONS

A After completing system installation, including outlet fittings and devices, inspect exposed finish. Contractor will remove burrs, dirt, and construction debris.
1. If applicable, the Contractor will repair damaged finishes, including chips, scratches, and abrasions.

B Contractor shall provide daily a clean work environment, free from trash/rubbish accumulated during and after cabling installation.

C Contractor shall keep all liquids (drinks, sodas, etc.) off finished floors, carpets, and tiles.
1. If any liquid or other detriment (cuts, soils, stains, etc.) damages the above finishes, Contractor shall provide professional services to clean or repair scratched/soiled finishes, at Contractor's expense.

1.11 COORDINATION

A In describing various materials, equipment and devices, in general each item may be described singularly, even though there may be a multiplicity of identical items. Also, where the description is general in nature, the exact sizes, duties, space arrangements, and other requirements must be obtained by reference to other portions of Contract Documents.

B Space allocations for materials, equipment and devices have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer. Verify that all materials, equipment and devices proposed for use on this Project are within the constraints of the allocated space.

C Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

D Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

E Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Firestopping" and in this Section.

F Roof-Mounted Equipment: Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.12 WARRANTY

A Contractor shall provide a minimum one (1) year warranty on installation and workmanship.

1.13 MAINTENANCE

A Support Availability: The Contractor shall commit to make available local support for the product and system during the Warranty or Extended Warranty period.

PART 2 PRODUCTS

2.1 IDENTIFICATION (LABELING) SYSTEM

A Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Brady
2. Brother
3. Dymo
4. Hellerman-Tyton

2.2 FIRESTOP SYSTEMS

A General:
1. Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
2. Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

B Manufacturers: Subject to compliance with requirements and with through-penetration firestop systems listed in Volume 2 of the UL Fire Resistance Directory, provide products by Specified Technologies, Inc. (STI) or Engineer approved equal.

C Materials:
1. Firestop Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture, the following products are acceptable:
   a. STI SpecSeal Series SSS Sealant.
   b. STI SpecSeal Series LCI Sealant.
2. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds, the following products are acceptable:
   a. STI SpecSeal Series SSP Putty.
3. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated on six sides with intumescent coating contained in a flame retardant poly bag, the following products are acceptable:
   a. STI SpecSeal Series SSB Pillows.
4. Fire-Rated Cable Grommet: Molded, two-piece grommet with an integral fire and smoke sealing foam membrane for sealing individual cable penetrations through framed wall assemblies. Grommet snaps together around cable and locks tightly into the wall. The following products are acceptable:
   a. STI EZ-Firestop Grommets.
5. Fire-Rated Cable Pathways: Device modules comprised of steel pathway with self-adjusting intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable:
   a. STI EZ-PATH Fire Rated Pathway.

2.3 SLEEVES FOR RACEWAYS AND CABLES

A Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, with burrs removed and insulating bushing fittings on ends.

B Sleeves for Rectangular Openings: Galvanized sheet steel.
1. Minimum Metal Thickness:
   a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
   b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.4 GROUT

A Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 EXECUTION

3.1 EXAMINATION

A Field Measurements
1. Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on shop drawings.
2. Coordinate fabrication schedule with construction progress to avoid delaying the work.

B Established Dimensions
1. Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating units without field measurements.
2. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

3.2 PREPARATION

A Contractor's RCDD shall review, approve and stamp all Shop Drawings, Submittal Documents, Coordination Drawings and As Built Drawings.

B Pre-Installation Inspection:
1. Contractor shall visually inspect all cables, cable reels, and shipping cartons to detect possible cable damage incurred during shipping and transport.
2. Visibly damaged goods are not acceptable and shall be replaced by the Contractor at no additional cost to the Owner.

3.3 IDENTIFICATION AND LABELING

A Cable labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.

B Flat-surface labels: Self-adhesive vinyl or vinyl-cloth labels, machine printed with alphanumeric cable designations.

3.4 CODES, RULES, PERMITS, FEES, INSPECTIONS, REGULATION, ETC.

A Contractor shall give all necessary notices, obtain and pay for all permits, government sales taxes, fees, inspections and other costs, including all utility connections, meters, meter settings, extensions, etc. in connection with his work.

B Contractor shall file all necessary plans, utility easement requests and drawings, survey information on line locations, load calculations, etc. prepare all documents and obtain all necessary approvals of all utility and governmental departments having jurisdiction; obtain all certificates of inspection for his work and deliver same to the Engineer before request for acceptance and final payment for the work.

C Ignorance of Codes, Rules, Regulations, Laws, etc. shall not render the Contractor irresponsible for compliance. The Contractor shall be versed in all Codes, Rules and Regulations pertinent to the work prior to submission of a proposal.

D Contractor shall include in the work, without extra cost, any labor, materials, services, apparatus and drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether or not indicated or specified.

E Where minimum code requirements are exceeded in the Design, the Design shall govern.

F Ensure that the work is accomplished in accordance with the OSHA Standards and any other applicable government requirements.

G All work relating to the handicapped shall be in accord with regulations currently enforced by the Authority Having Jurisdiction.

H Where conflict arises between any code and the plans and/or specifications, the code shall apply except in the instance where the plans and specifications exceed the requirements of the code. Any changes required as a result of these conflicts shall be brought to the attention of the Engineer at least ten working days prior to bid date, otherwise the Contractor shall make the required changes at his own expense. The provisions of the codes constitute minimum standards for wiring methods, materials, equipment and construction and compliance therewith will be required for all electrical work, except where the drawings and specifications require better materials, equipment, and construction than these minimum standards, in which case the drawings and specifications shall be the minimum standards.

3.5 CUTTING AND PATCHING

A Unless otherwise indicated or specified, each Contractor shall provide cutting and patching necessary to install the work specified in this Division. Patching shall match adjacent surfaces to the satisfaction of the Engineer and shall be in accord with the Architect's standards for such work, as applicable.

B Each Contractor shall be responsible for all openings, sleeves, trenches, etc. that he may require in floors, roofs, ceilings, walls, etc. and shall coordinate all such work with the General Contractor and all other trades. Contractor shall coordinate with the General Contractor any openings which he is to provide before submitting a bid proposal in order to avoid conflict and disagreement during construction. Improperly located openings shall be reworked at the expense of the responsible Contractor.

C Each Contractor shall plan his work ahead and shall place sleeves, frames or forms through all walls, floors and ceilings during the initial construction, where it is necessary for conduit, conductors, wireways, etc. to go through; however, when this is not done, this Contractor shall do all cutting and patching as well as reinforcement required for the installation of his work, or he shall pay other trades for doing this work when so directed by the Engineer. Any damage caused to the buildings by the workmen of the responsible Contractor must be corrected or rectified by him at his own expense.

D Cut holes in casework, equipment panels, etc. (if any), as required to pass pipes in and out.

E Notify other trades in due time where openings of chases in new concrete or masonry are required. Set all concrete inserts and sleeves for work. Failing to do this, cut openings for work and patch same as required at own expense.

F Openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe cut with a masonry saw.

G No structural members shall be cut without the approval of the Structural Engineer and all such cutting shall be done in a manner directed by him.

H Each Contractor shall be responsible for properly shoring, bracing, supporting, etc. any existing and/or new construction to guard against cracking, settling, collapsing, displacing or weakening while openings are being made. Any damage occurring to the existing and/or new structures, due to failure to exercise proper precautions or due to action of the elements, shall be promptly and properly made good to the satisfaction of the Engineer.

I All work improperly done or not done at all as required by the Communications trades in this section will be performed by the General Contractor at the direction of the Contractor whose work is affected. The cost of this work shall be paid for by the Contractor responsible.

3.6 SLEEVES AND PLATES

A Provide and locate all sleeves and inserts required for work before the floors and walls are built or be responsible for the cost of cutting and patching required where sleeves and inserts were not installed, or where incorrectly located. Each Contractor shall do all drilling required for the installation of his hangers. Drilling of anchor holes may be prohibited in post-tensioned concrete construction, in which case the Contractor shall request approved methods from the Architect and shall carefully coordinate setting of inserts, etc., with the Structural Engineer and/or Architect.

B Galvanized steel sleeves shall be provided for all communications conduit passing thru concrete floor slabs and concrete, masonry, tile and gypsum wall construction.

C Cast iron sleeves shall be installed through all walls where pipe enters the building below grade. Sleeves shall be flush with each face of the wall and shall be sufficiently larger than the entering pipe to permit thorough caulking with lead and oakum between pipe and sleeve for waterproofing.

D In all cases, sleeves shall be at least two pipe sizes larger than nominal pipe diameter.

E Where conduit motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Check floor and wall construction finishes to determine proper length of sleeves for various locations; make actual lengths to suit the following:
1. Sleeves shall protrude 2 in. beyond penetrated walls, partitions and ceiling.
2. In areas where conduits are concealed, as in chases, terminate sleeves flush with floor.
3. In all areas where conduits are exposed, terminate sleeves 2 in. above finished floor.

F Sleeves shall be constructed of 24-gauge galvanized sheet steel with lock seam joints for all sleeves set in concrete floor slabs terminating flush with the floor. All other sleeves shall be constructed of galvanized steel pipe unless otherwise indicated on the drawings.

G Fasten sleeves securely in floors, walls, so that they will not become displaced when concrete is poured or when other construction occurs around them. Take precautions to prevent concrete, plaster or other materials being forced into the space between pipe and sleeve during construction. Fire and smoke stop all sleeves in a manner approved by the local authority having jurisdiction or per prevailing codes.

H Sleeves passing through exterior wall (none are permitted thru roof) or where there is a possibility of water leakage and damage shall be caulked water tight for horizontal sleeves and flashed and counter-flashed with lead (4 lb.) or copper and soldered to the piping, lapped over sleeve and properly weather sealed. All roof penetrations shall be made inside mechanical equipment curbs.

I All rectangular or special shaped openings in plaster, stucco or similar materials including gypsum board shall be framed by means of plaster frames, casing beads, wood or metal angle members as required. The intent of this requirements is to provide smooth even termination of wall, floor and ceiling finishes as well as to provide a fastening means for lighting fixtures, panels, etc. Lintels shall be provided where indicated over all openings in bearing walls, etc.

3.7 WEATHERPROOFING

A Where any work pierces waterproofing, including waterproof concrete, the method of installation shall be as approved by the Architect and/or Engineer before work is done. Furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

B Wherever work penetrates roofing, it shall be done in a manner that will not diminish or void the roofing guarantee or warranty in any way. Coordinate all such work with the roofing installer.

3.8 FIRESTOPPING

A Refer to Division 07 Section “Firestopping” for additional requirements.

B Preparation:
1. Examination of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.
3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
4. Do not proceed until unsatisfactory conditions have been corrected.

C Through-Penetration Firestop System Installation:

1. Install through-penetration firestop systems in accordance with the conditions of testing and classification as specified in the published design.
2. Comply with manufacturer's instructions for installation of through-penetration firestop systems products.
3. Seal all openings or voids made by penetrations to ensure an air and water resistant seal.
4. Protect materials from damage on surfaces subjected to traffic.

D Do not penetrate rated fire walls, ceilings or floors with conduit, cable, wireway or other raceway system unless all penetrations are protected in a code compliant manner which maintains the fire-rating of the assembly. Firestop all openings made in walls, chases, ceilings and floors. Patch all openings around conduit, wireway, etc., with appropriate type material to provide needed fire rating at fire walls, ceilings and floors. Fire proofing materials and method of application shall be approved by the local authority having jurisdiction.

E Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly.

F Apply putty pads to boxes located in fire-rated wall assemblies in which a horizontal distance of greater than 24" between boxes is not maintained.

G Install and seal penetrations (conduit, sleeves, slots, chases) into or through fire-rated barriers created by or made for or on the behalf of the Contractor to prevent the passage of smoke, fire, toxic gas, or water through the penetrations.

H Coordinate firestopping procedures and materials with General Contractor.

I Solutions and shop drawings/submittals for firestop materials and systems shall be presented to the General Contractor for written approval of materials/systems prior to purchase and installation.

J Following the pathway of others through compliant and non-compliant penetrations does not remove the requirement to maintain code-compliant firestopping.

K Supply Owner with training manuals with instructions on methods of adding or removing cabling to/from firestopped sleeves and chases.

L Provide manufacturer recommended material for rated protection for any given barrier.

M Laminate and permanently affix adjacent to chases the following information:
1. Manufacturer of firestop system
2. Date of installation/repair.
3. Part and model numbers of system and all components
4. Name and phone numbers of local distributor and manufacturer's corporate headquarters

N The material chosen shall be distinctively colored to be clearly distinguishable from other materials, adhere to itself, and maintain the characteristics for which it is designed to allow for the removal and/or addition of communication cables without the necessity of drilling holes in the material.

3.9 TESTING

A Upon completion of the communications infrastructure systems, including all pathways and grounding, the Contractor shall test the system.
1. Cables and termination modules shall be affixed, mounted or installed to the designed/specified permanent location prior to testing.
2. Any removal and reinstallation of any component in a circuit, including faceplates, shall require retesting of that circuit and any other disturbed or affected circuits.
3. Cable/jack shall be affixed, mounted or installed to the designed/specified permanent location prior to testing.
    a. Any removal and reinstallation of any component in the circuit shall require retesting of that circuit.
4. Approved instruments, apparatus, services, and qualified personnel shall be utilized.

5. If tests fail, Contractor shall correct as required to produce a legitimate passing test.
6. Manipulation of tester parameters on a failing test in order to achieve a passing test is unacceptable.
7. If the Contractor is found to have manipulated or falsified any failing test result to show a “PASS” for any reason (without written notice and prior approval of the Owner), the Contractor shall be required to employ a Third-Party Testing Agent selected by the Owner to retest the complete cable plant and shall be required to pay all costs associated with this retesting.

B These specifications will be strictly enforced.
1. The Contractor must verify that the requirements of the specifications are fully met through testing with an approved tester (rated for testing parameters listed elsewhere), and documentation as specified below.
2. This includes confirmation of requirements by demonstration, testing and inspection. Demonstration shall be provided at final walk-through in soft copy and printed test data.

C Notification of the likelihood of a cable exceeding standardized lengths must be made prior to installation of the cable.
1. Without contractor’s prior written notice and written approval by the Owner, testing that shows some or all pairs of cable not meeting specifications, shall be replaced at Contractor’s expense (including respective connectors).
2. With the Owner’s written approval, the over-length cable(s) shall be excluded from requirements to pass standardized tests and shall be explicitly identified.

D Testing is still required for non-compliant cabling.
1. The tests shall be for wire-mapping, opens, cable-pair shorts, and shorts-to- ground.
2. The test results must be within acceptable tolerances and shall be submitted with the Owner’s acceptance document.

E Contractor will complete all work and documentation according to manufacturer guidelines to ensure manufacturer’s warranty remains in effect.
1. Contractor shall obtain certificates from manufacturer attesting to warranty being in effect and include certificates with other deliverables due at the completion of the project.

F Owner reserves the right to be present during any or all testing.

3.10 SCAFFOLDING, RIGGING AND HOISTING

A Furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required in strict accordance with OSHA Guidelines.

3.11 OPTION TO RELOCATE DEVICES

A The location of voice and data outlets and other similar devices along with their associated connections may be relocated at the Owner's option, at no additional cost to the Owner, to a point within 10 feet of their present location provided the Contractor is notified prior to rough-in or installation.

3.12 CLEANING

A Work areas will be kept in a broom clean condition throughout the duration of the installation process.

B Remove all unnecessary tools and equipment, unused materials, packing materials, and debris from each area where Work has been completed unless designated for storage.

C The Contractor will damp clean all surfaces prior to final acceptance by Owner.

D After completion of all work and before final acceptance of the work, thoroughly clean all equipment and materials and remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of equipment, fixtures and all other associated or adjacent fabrication.

3.13 ACCEPTANCE

A Once all work has been completed, test documentation has been submitted, and Owner is satisfied that all work is in accordance with contract documents, the Owner shall notify Contractor in writing of formal acceptance of the system.

B Contractor must warrant in writing that 100% of the installation meets the requirements specified herein (Standards Compliance & Test Requirements).

C Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% PASS rating, and receipt of full documentation soft and hard copies as describe herein.

3.14 INDEMNIFICATION

A The Contractor shall hold harmless and indemnify the Engineer, employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and/or liability resulting from, brought for, or on account of any personal injury or property damage received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed under or related to this contract, resulting in whole or in part from the negligence of the Contractor, any subcontractor, any employee, agent or representative.

3.15 HAZARDOUS MATERIALS

A Any worker, occupant, visitor, inspector, etc., who encounters any material of whose content they are not certain shall promptly report the existence and location of that material to the Contractor and/or Owner. The Contractor shall, as a part of his work, ensure that his workers are aware of this potential and what they are to do in the event of suspicion. He shall also keep uninformed persons from the premises during construction. Furthermore, the Contractor shall insure that no one comes near to or in contact with any such material or fumes therefrom until its content can be ascertained to be non-hazardous.

B CMTA, Inc., Consulting Engineers, have no expertise in the determination of the presence of hazardous materials. Therefore, no attempt has been made by them to identify the existence or location of any such material. Furthermore, CMTA nor any affiliate thereof will neither offer nor make any recommendations relative to the removal, handling or disposal of such material.

C If the work interfaces, connects or relates in any way with or to existing components which contain or bear any hazardous material, asbestos being one, then, it shall be the Contractor's sole responsibility to contact the Owner and so advise him immediately.

D The Contractor by execution of the contract for any work and/or by the accomplishment of any work thereby agrees to bring no claim relative to hazardous materials for negligence, breach of contract, indemnity, or any other such item against CMTA, its principals, employees, agents or consultants. Also, the Contractor further agrees to defend, indemnify and hold CMTA, its principals, employees, agents and consultants, harmless from any such related claims which may be brought by any subcontractors, suppliers or any other third parties.

END OF SECTION

Section 28 05 03
Electronic Safety and Security Shop Drawings and Submittals

Part 1 General

1.01 Shop Drawings and Submittals

A. Each Contractor shall submit to the Architect and/or Engineer, within thirty days after the date of the Contract, sets of shop drawings and/or manufacturer's descriptive literature (coordinate exact quantity with architectural specifications) on all equipment required for the fulfillment of his contract. Each shop drawing and/or manufacturer's descriptive literature shall have proper notation indicated on it and shall be clearly referenced per the specifications and/or schedules, etc., so that the Architect and/or Engineer may readily determine the particular item the Contractor proposes to furnish. All data and information scheduled, noted or specified by hand shall be noted in color red on the submittals. The Contractor shall make any corrections or changes required and shall resubmit for final review as requested. Review of such drawings, descriptive literature and/or schedules shall not relieve the Contractor from responsibility for deviation from drawings or specifications unless they have, in writing, directed the reviewer's attention to such deviations at the time of submission of drawings, literature and manuals; nor shall it relieve them from responsibility for errors or omissions of any nature in shop drawings, literature and manuals. The term "as specified" will not be accepted.

B. If the Contractor fails to comply with the requirements set forth above, the Architect and/or Engineer shall have the option of selecting any or all items listed in the specifications or on the drawings, and the Contractor will be required to provide all materials in accordance with this list.

C. Review of shop drawings by the Engineer applies only to conformance with the design concept of the project and general compliance with the information given in the contract documents. In all cases, the installing Contractor alone shall be responsible for furnishing the proper quantity of equipment and/or materials required, for seeing that all equipment fits the available space in a satisfactory manner and that piping, electrical and all other connections are suitably located.

D. The Engineer's review of shop drawings, schedules, product data or other required submittal data shall not relieve the Contractor from responsibility for the adaptability of the equipment or materials to the project, compliance with applicable codes, rules, regulations, information that pertains to fabrication and installation, dimensions and quantities, electrical characteristics, and coordination of the work with all other trades involved in this project.

E. No cutting, fitting, rough-in, connections, etc., shall be accomplished until reviewed equipment shop drawings are in the hands of the Contractors concerned. It shall be each Contractor's responsibility to obtain reviewed shop drawings and to make all connections, etc. in the neatest and most workmanlike manner possible. Each Contractor shall coordinate with all the other Contractors having any connections, roughing-in, etc., to the equipment, to make certain proper fit, space coordination, voltage and phase relationships are accomplished.

F. In accord with the provisions specified hereinbefore, shop drawings, descriptive literature and schedules shall be submitted on each of the following indicated items as well as any equipment or systems deemed necessary by the Engineer:
   1. Raceways:
      a. Conduit (each type).
      b. Bridle ring assembly.
      c. J-hook assembly.
      d. Junction, pull, and device boxes
   2. Systems: Each system submittal is to be complete with legible cutsheets for all devices, equipment, special wiring, etc. Also, provide scaled building layout drawings that indicate device placement, wiring, etc. Refer to the specific system's specification for additional submittal requirements where required.
      a. Emergency Responder Radio Antenna System
      b. Access Control System and Hardware Devices
      c. Intrusion Detection System

d. Video Surveillance System
e. Fire alarm system.

3. Miscellaneous
   a. Control panel assemblies.
   b. Non-standard junction/pullboxes

G. Specification Compliance Certification: Where this Section and other Sections of this Division require Specification Compliance Certification to be submitted, comply with the following:
   1. Prepare a line-by-line Specification Compliance Certification by marking up a copy of the Contract Document specification section in the left margin. Accompany the markup with a written report explaining all items that are not marked with “Compliance”. Submit line-by-line markup, written report of deviations and alternates and a cover letter certified by Manufacturer or Installer that prepared the Specification Compliance Certification. Use the following key for preparing the line-by-line markup.
      a. “C” for Compliance: By noting the term "compliance" or "C" in the margin, it shall be understood that the manufacturer is in full compliance with the item specified and will provide exactly the same with no deviations.
      b. “D” for Deviation: By noting the term "deviation" or "D" in the margin, it shall be understood that the manufacturer prefers to provide a different component in lieu of that specified.
      c. “A” for Alternate: By noting the term "alternate" or "A" in the margin, it shall be understood that the manufacturer proposes to provide the same operating function but prefers to do it in a different manner.
      d. “N/A” for Not Applicable: By noting the term “not applicable” or “N/A” in the margin, it shall be understood that the specified item is not applicable to the project.

1.02 Special Wrenches, Tools and Keys

A. Each Contractor shall provide, along with the equipment provided, any special wrenches or tools necessary to dismantle or service equipment or appliances installed by him. Wrenches shall include necessary keys, handles and operators for valves, switches, etc. and keys to alarm pull boxes, panels, etc. At least two of any such special wrench, keys, etc. shall be turned over to the Architect prior to completion of the project. Obtain a receipt that this has been accomplished and forward a copy to the Engineer.

1.03 Fire Alarm Shop Drawings

A. The Contractor and equipment supplier shall submit to the Architect and/or Engineer, fire alarm system shop drawings complete with catalog cuts, descriptive literature and complete system wiring diagrams for their review prior to submittal to the authority having jurisdiction for their review.

1.04 Maintenance and Operation Manuals

A. Upon substantial completion of the project, the Electrical Contractor shall deliver to the Engineers (in addition to the required Shop Drawings) three complete copies of operation and maintenance instructions and parts lists for all equipment provided. These documents shall at least include:
   1. Detailed operating instructions.
   2. Detailed maintenance instructions including preventive maintenance schedules.
   3. Addresses and phone numbers indicating where parts may be purchased.
   4. Reference architectural specifications for additional requirements.

B. Refer to individual contract document specification sections for additional requirements.

Part 2 Products (Not Applicable)

Part 3 Execution (Not Applicable)

End of Section

SECTION 28 05 10 - SCOPE OF THE ELECTRONIC SAFETY AND SECURITY WORK

PART 1 GENERAL

1.1 SUMMARY

A Each Contractor's attention is directed to Section 28 00 00 – Common Electronic Safety and Security Requirements and all other Contract Documents as they apply to his work.

1.2 SCOPE

A The Electronic Safety and Security work for this project includes all labor, materials, equipment, devices, and related items required to completely install, test, place in service and deliver to the Owner complete safety and security systems in accordance with the accompanying plans and all provisions of these specifications. This work shall primarily include, but is not limited to the following:
1. All j-hooks, fittings, etc.; coordinate with Division 26.
2. All wiring devices and device plates.
3. All system hardware, equipment and installation.
4. All programming, scheduling and testing.

B Grounding, per NEC and the specified requirements.

C All necessary fees and cost for permits, inspections, etc.

D Coordination with Division 21 for interface with fire suppression systems.

E Coordination with Division 23 for interface with HVAC systems and instrumentation and control system.

F Coordination with Division 26 for power, rough-in, conduit and pathways.

G Coordination with Division 27 for low voltage structured cabling and intercommunications and program systems.

H Emergency responder radio antenna system as indicated.

I Access control system and hardware devices as indicated.

J Intrusion detection system as indicated.

K Video surveillance system as indicated.

L Fire alarm system as indicated.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 28 05 37 - EMERGENCY RESPONDER RADIO ANTENNA SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A Provide, on a turn-key basis, a complete new emergency responder radio antenna system (ERRAS) for the _____ facility:

1. Qualify (Pre-Test): Conduct site testing before and during construction to determine whether the facility has adequate signal levels for emergency responders' radios to function inside the building. Refer to this Section and codes referenced herein for prescriptive minimum indoor signal levels, and signal level verification testing procedure, system design requirements, plan submittal requirements, and system acceptance requirements.
2. Delegated Design: Where augmentation of coverage is required by authorit(ies) having jurisdiction, design an in-building Emergency Responder Radio Antenna System (ERRAS) to provide radio coverage throughout the entire facility.
    a. 'Entire Facility' means all existing and new sections of the facility where the AHJ would require radio coverage were that facility constructed new. Systems providing partial coverage or covering only addition or renovation areas do not meet the 'entire facility' requirement.
    b. The system will support only the emergency responder radio system and no others. Provisions for supporting other cell phone carriers, Wi-Fi signals, and the Owner’s private security and/or maintenance radio systems shall not be included.
3. Construct: Furnish and install the ERRAS per the design described above, and acceptance-test per AHJ and code. Provide all equipment, materials, labor, supervision and services necessary for- or incidental to- the installation of the system as described herein.
    a. It shall be the responsibility of the Emergency Responder Radio Antenna System Contractor to obtain all required permits, approvals and certifications from the AHJ. All fees associated with the licensing shall be paid by the Contractor.
    b. Final acceptance and approval are required from the local AHJ in writing prior to contract closeout.

B Section Includes:

1. Bi-directional amplifiers (BDA’s).
2. Distributed antenna system.
3. Coaxial cables.
4. Splitters and direction couplers.
5. Battery Back-Up System or UPS.
6. All other equipment and components necessary for a complete and functioning Emergency Responder Radio Antenna System.

C Related Sections include the following:

1. Division 26 Section "Raceways and Boxes for Electrical Systems" for raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
2. Section 28 46 00 - Fire Detection and Alarm for interface of Emergency Responder Radio Antenna System with the fire alarm system.

1.2 DEFINITIONS

A ADA Standards: Accessibility standards enacted by the Americans with Disabilities Act

B AHJ: Authority Having Jurisdiction.

C Attenuation: The reduction in signal power, expressed in decibels (dB), as a result of coupling, heat loss, or transmission distance in a cable or in air.

D BDA: Bi-Directional Amplifier. Device used to amplify band-selective or multi-band RF signals in the uplink, to the base station for enhanced signals and improved coverage.

E CBC: Coupled Bonding Conductor. A bonding conductor placed on the outside of any technology cable used to suppress transient noise.

F DAQ: Delivered Audio Quality, as defined in TIA TSB-88.

G DAS: Distributed Antenna System. A network of service antennas connected at intervals along shielded coaxial transmission lines and all connected to head-end electronics amplifying the signals to be distributed. Often refers to a system that includes both the passive distribution system and the active amplifying electronics.

H Directional Coupler. A component which directs a small portion of downstream RF energy to a port which can be connected to an antenna or another branch of distribution cabling, and also serves as a combiner of upstream energy between the tap port and through the connection port.

I Donor Antenna: The antenna, usually mounted on the outside of a structure where a DAS is installed, which picks up signals over-the-air from a donor service.

J Donor Source: The repeater, transceiver, cell site, or other radio site that produces signals which a DAS will relay and distribute.

K ERRAS: Emergency Responder Radio Antenna System. A two-way radio communication system installed to assure the effective operation and coverage of radio communications systems for fire, emergency medical services and/or law enforcement agencies within a building or structure. A system used by firefighters, police, and other emergency services personnel.

L EMT: Electrical Metallic Tubing.

M FCC: Federal Communications Commission. Federal agency responsible for implementing and enforcing America’s communications laws and regulations.

N LSC: The Life Safety Code, NFPA 101.

O NEC: The National Electrical Code, NFPA 70.

P Public Safety/First Responder: Agencies which are charged with the responsibility of responding to emergency situations. These include, but are not limited to, law enforcement department, fire departments, and emergency medical companies.

Q Reflected Power: Power which is reflected back along a transmission line as a result of discontinuities in line impedance caused at connectors or close proximity of metallic objects.

R RF: Radio Frequency. Energy from electromagnetic waves, or alternating currents that produce electromagnetic waves, in the spectrum of radio frequencies 30 kHz to 300 GHz.

S Splitter: A passive component that has a single input port and two or more output ports, effectively splitting the signal equally amongst the output ports. It also serves to combine upstream signals from the “output” ports into composite signals at the “input” port.

1.3 REFERENCE STANDARDS AND REGULATIONS

Codes, regulations and standards referenced in- and/or applicable to this Section include:

A 47 CFR 22 - United States Code of Federal Regulations, Title 47, Part 22 - Public Mobile Services; Current edition.

B 47 CFR 90 - United States Code of Federal Regulations, Title 47, Part 90 - Private Land Mobile Radio Services; Current edition.

C 47 CFR 101 - United States Code of Federal Regulations, Title 47, Part 101 - Fixed Microwave Services.; Current edition.

D ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

E IFC - International Fire Code (International Code Council); Edition adopted by Authority Having Jurisdiction, including all applicable Amendments and Supplements.

F NFPA 1 - Fire Code; Most recent edition cited adopted by Authority Having Jurisdiction, including all applicable Amendments and Supplements.

G NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

I NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J NFPA 1225 - Standard for Emergency Services Communications; 2022.

K OET Bulletin 65 - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; 97-01.

L TIA TSB-88 - Wireless Communications Systems - Performance in Noise- and Interference-Limited Situations; Current edition.

M UL 2524 - Emergency Responder Communication Enhancement Systems; Current edition.

1.4 ACTION SUBMITTALS

A General Submittal Requirements:
1. Submit product data and shop drawings in accordance with Division 01 and Division 28 Section “Electronic Safety and Security Shop Drawings and Submittals” for products specified under PART 2 - PRODUCTS.
2. Submittals shall be approved by AHJ prior to submitting them to Architect and Engineer.

B Delegated Design Submittal: Contractor shall perform all planning, calculations, etc. necessary for a complete ERRAS, and prepare and submit to Authority Having Jurisdiction all documentation required for plan review and permitting, including but not limited to floor plans, riser diagrams, and description of operation.

C Product Data: For each type of proposed system component specified, including dimensioned drawings showing minimum clearances and installed features.
1. Product Data: Provide copies of manufacturer specification sheets of all proposed system components including:
   a. Amplifiers
   b. Antennas
   c. Coaxial cable, couplers, splitters, combiners, or other passive components
   d. Backup battery and charging system with run time specifications
2. Submit product certificates signed by the manufacturer of radio system components certifying that their products comply with specified requirements.
3. An indication of any deviations from Contract Documents requirements, including variations and limitations. Show any revisions to equipment layout required by use of selected equipment.
4. A product data index and complete equipment list including each product submitted for approval with the manufacturer’s name, part number and any included options or selections.
5. Specification Compliance Certification: Submit a Specification Compliance Certification in accordance with Division 28 Section “Electronic Safety and Security Shop Drawings and Submittals”.

D Shop Drawings:

1. Signal Strength Test Results: Provide summary of pre-construction and mid-construction field test results.
2. Submit shop drawings locating all components of the system indicating circuit routing, cable type, and gauge. Include information that will allow the Contractor to coordinate interdisciplinary work and when necessary guide the manufacturer or fabricator in producing the product.
3. Include elevation detail names for each elevation view. Sheet title shall include site name, address, sheet number, floor plan number and north arrow. Include site plan view of the subject buildings and surrounding property to clearly indicate the location and orientation of roof mounted outdoor antennas associated with the proposed system.
4. Include a minimum of one (1) building elevation depicting the location of any outdoor antenna associated with the proposed system. Include height of antenna centerline above building, orientation, and location of all external grounding connections.
5. Include a detail plan view of all IT rooms housing head-end and/or other consolidated equipment, showing the location of the rack(s) and/or enclosure(s) of the ERRAS equipment.
6. Include a separate plan view of each interior floor where indoor antenna systems are proposed. Include antenna numbers, coaxial cable routes, and the locations of any other system components including splitters, couplers, filters, amplifiers, etc. All component shall be named or labeled for reference in power budget calculations tables. Overlay approximated coverage radii indicating -95 dBm downlink (base to mobile) signal strength around each proposed indoor coverage antenna. Include results of any previous coverage testing per grid, if available.
7. Include a minimum of one (1) detail elevation view(s) of all rack(s) and/or enclosure(s) housing the ERRAS equipment. Identify each piece of equipment by brand, model number and equipment type.
8. Specify antenna grounding and surge protection in accordance with NEC Article 810.
9. Specify the back-up power source (Life Safety), and include calculations to ensure the back-up power requirements as specified in this standard are met.
10. Wiring Diagrams:
    a. Submit wiring diagrams from manufacturer differentiating clearly between factory and field-installed wiring. Include diagrams for each component of the system with all terminals and interconnections identified. Make all diagrams specific to this Project.

1.5 INFORMATIONAL SUBMITTALS

A Qualification Data: For Installer.
1. Copies of FCC Licenses for both the Designer and Project Manager.
2. Letter from manufacturer stating that the Contractor is an Authorized Factory Distributor for the area where Project is located.
3. The system described in the submittals shall be certified by an FCC Licensed Designer and installation shall be supervised by an FCC Licensed Project Manager.

B Field quality-control reports.

C Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A Operation and Maintenance Data: For radio systems and components to include in emergency, operation, and maintenance manuals.
1. Include data for each type of product, including all features and operating sequences, both automatic and manual.
2. Provide names, addresses, and telephone numbers of service organizations that carry stock of repair parts of the system to be furnished.
3. Include record of field tests of the radio system.
4. Provide a parts list with manufacturer and model number for commonly replaced parts.
5. Include complete instructions for the inspection, testing, and maintenance of the system. Include copies of all calculation sheets used to configure the system.

B Testing reports: Include field test records pertaining to design and installation of the ERRAS in the closeout documentation. These shall include, but not be limited to:
1. Preconstruction Tests.
2. Mid-Construction Tests.
3. Final Testing: Tests performed in conforming with IFC Section 510.5.3 and Section 510.6. This testing is to be signed off by the AHJ. Engineers shall also be present for the final testing process.

1.7 QUALITY ASSURANCE

A Installer Qualifications: Engage an experienced factory-authorized installer to perform work of this Section. The Contractor shall meet the following requirements:
1. As a business entity, shall be an authorized distributor and designated representative of the ERRAS manufacturer, with full warranty privileges, and shall have been actively engaged in the business of selling, installing, and servicing ERRAS for a period of at least five (5) years.
2. Employ factory trained technicians capable of supporting the maintenance of the system. No contract employees are allowed unless they have been to the factory service school within the last 18 months. A certificate of this training shall be provided with the Contractor's submittal.
3. Employ full time local technicians and installers. The manufacturer shall maintain a full-time factory employed service staff for product support and service.
4. Maintain an office within 150-miles of the job site, staffed with trained technicians who are qualified and licensed to supervise the installation, to be responsible that the system is installed as submitted, to conduct system start up and perform a 100 percent operational audit of all installed devices, to instruct the Owner's representatives in the proper operation of the system, and to provide service throughout the warranty period.
5. Fully experienced in the design and installation of the type of system herein specified and shall furnish with the contract proposal an itemized list of the installations of the type specified herein. The list shall include the name of the project, date of completion, the amount of the contract, the name and telephone number of a qualified person to contact for reference. This list must contain at least two (2) projects within a 150-mile radius of the school district to allow school administration officials to visit the job site for review of the system installation and service. Each reference project listed must utilize equipment by the same manufacturer as the proposed system.
6. Not have any grievances or complaints of record regarding workmanship, code compliance, or service response. A Contractor that has any prior finding(s) of a code or license violation or has any litigation in process concerning the installation of a system is unacceptable.

B Source Limitations for Radio System and Components: Obtain radio system components from a single source who assumes responsibility for compatibility of system components.

C Radio Components, Devices, and Accessories: All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards. Where copper cabling is routed to an area, either in another building, or with a separate electrical service, the Technology Contractor shall provide primary protective equipment.

D Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E All racks and enclosures shall be either welded or assembled with paint piercing ground washers, grounding strip and bonding jumper.

1.8 WARRANTY

A Special Warranty: Manufacturer agrees to repair or replace radio system equipment and components that fail in materials or workmanship within specified warranty period.
1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Any equipment, cabling or wiring shown to be defective shall be replaced, repaired, or adjusted free of charge.

3. All labor and materials shall be provided at no expense to the Owner.
4. Warranty Period: One (1) year from date of Substantial Completion.

B Immediately prior to the end of the warranty period, the system shall be inspected and certified for the following year at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Manufacturers: Subject to compliance with requirements, available integrators offering products that may be incorporated in the work include, but are not limited to:
1. ADRF
2. Axell Wireless.
3. Farenhyt by Honeywell.
4. Gamewell-FCI by Honeywell.
5. Notifier by Honeywell.
6. SOLiD Technologies, Alliance Corporation.
7. Tessco.
8. Times Microwave.

2.2 GENERAL PERFORMANCE REQUIREMENTS

A Compatibility: The equipment, including but not limited to repeaters, transmitters, receivers, signal boosters, cabling, fiber distributed antenna system, etc., shall not interfere with the existing communication systems utilized by the Public Safety and First Responder agencies.

B Rooftop installations shall require a pitch pocket for proper weathertight roof penetrations.

C Survivability:
1. Physical Protection: All wiring and fiber optics shall be installed in conduit. Refer to Division 26 Section “Raceways and Boxes for Electrical Systems” for type, sizing and installation standards.
2. Fire Performance: All main risers or trunks of the antenna system shall be installed with resistance to attack from a fire. (See requirements below)
3. Cabinet: The signal booster and all associated RF filters shall be housed in a single, NEMA 4 certified, painted steel weather tight box. The cabinet shall be large enough to dissipate internal heat without venting the inside of the cabinet to the outside atmosphere.
4. Operating Temperatures: -22 degrees F to +120 degrees F minimum temperature range, including microprocessors. Equipment installed on the roof of structures shall be rated for the expected extreme temperatures associated with rooftop installations.
5. Degraded Performance in Emergencies: The system shall be designed to allow degraded performance in adverse conditions, such as abnormally high temperatures resulting from nearby fires, extreme voltage fluctuations or other abnormal conditions that may occur during an emergency. Circuits that intentionally disable the signal booster in such situations (i.e. over/under voltage, over/under current, over/under temperature, etc.) will not be implemented as the standard mode for public safety applications.

D Signal Strength:
1. Downlink or Inbound Signal: A minimum signal strength of -95 dBm and a DAQ of 3.5 shall be receivable throughout 95 percent of the building. In critical areas, the signal coverage should be receivable over 99 percent of the critical areas such as, command center(s), fire pump rooms, stairs, elevator lobbies, and sectional valve locations or others as defined by the AHJ.
2. Uplink or Outbound Signal: Minimum signal strength of -95 dBm received at the local Fire Department Radio System from the coverage area.
3. Isolation: A donor antenna must maintain isolation from the distributed antenna system. The donor antenna signal level shall be a minimum of 15 dB above the distributed antenna system under all operating conditions.

2.3 COMPONENT PERFORMANCE REQUIREMENTS AND SPECIFICATIONS

A BDA Requirements:

1. Buildings and structures shall be equipped with an FCC Certificated Class B Bi-Directional Amplifier (BDA) as needed to meet coverage requirements.
2. Mode of Operation: The system shall be normally powered on and shall continuously provide passing of frequencies within the Public Safety and First Responder bands.
3. All in-building radio systems shall be compatible with both analog and digital communications simultaneously at the time of installation.
4. Bi-directional amplifiers shall be FCC Certified and registered prior to installation. BDA system shall be listed UL 2524.
5. RF Performance:
    a. Supported Frequencies: The radio system shall support VHF, UHF, and frequencies in the 700 and 900 MHz as required for local public safety and first responder bands as utilized by the local municipality.
    b. Reject Filters: Notch filter sections shall be incorporated to minimize adjacent channel cellular and SMR degradation of the signal booster performance. The minimum downlink band adjacent band rejection shall be 35 dB or greater at 865 MHz and 870 MHz.
    c. Band Migration Capability: The signal booster shall include re-tunable or replaceable filters to accommodate rapid and economic passband changes in the event of mandatory FCC changes within the NPSPAC band. The use of non-adjustable and non-replaceable RF input and output filters is prohibited.
    d. Output Level Control: An automatic output leveling circuit shall be included for both passbands with a minimum dynamic range of 60 dB, less any gain reduction setting, to maintain FCC out of band and spurious emission compliance.
6. Power Supplies:
    a. At least two (2) independent and reliable power supplies shall be provided, one primary and one secondary.
    b. The primary power source shall be supplied from a dedicated 20 ampere branch circuit and comply with NFPA 72 4.4.1.4. Coordinate location and size of circuit(s) required for system with project Electrical Contractor.
    c. The secondary power source shall be a dedicated battery capable of operating with in-building radio system for at least 24 hours of 100 percent system operation. The battery system shall automatically charge in the presence of external power input. The battery system shall be contained in one NEMA 4 or 4X type enclosure.
    d. Power supply integrity shall be monitored in accordance with NFPA 72 4.4.7.3.

B Passive Equipment & Cable Requirements:

1. Bandwidth: Passband for equipment and cable shall include 700-900 MHz.
2. The distributed antenna system may utilize a radiating cable, fixed antennas or a combination of both.
3. Cable shall be rated for fire plenum and riser rating, as applicable to installation location.
4. Cable risers & trunks shall be designed and installed with resistance to attack from a fire using one of the following methods:
    a. A 2-hour fire rated cable or cable system.
    b. Routing the cable through a 2-hour fire rated enclosure(s) or shaft(s).
    c. System configured in a looped design, routing through 1-hour fire rated enclosure(s) or shaft(s). The circuit shall be capable of transmitting and receiving a signal during a single open or non-simultaneous single ground fault on a circuit conductor.
    d. Performance alternative approved by the authority having jurisdiction.

2.4 SYSTEM MONITORING

A The ERRAS shall include a connection to the fire alarm system. The ERRAS shall include automatic supervisory and trouble signals for malfunctions of the signal booster(s) and power supply(ies) that are annunciated by the fire alarm system and comply with the following:
1. The integrity of the circuit monitoring signal booster(s) and power supply(ies) shall comply with NFPA 72. Coordinate and provide this integration, as part of this system, with the fire alarm system contractor that is authorized to service the facility's fire alarm system.
2. System and signal booster(s) supervisory signal shall include the following:
   a. Antenna malfunction
   b. Signal booster failure
3. Power supply supervisory signals shall include the following for each signal booster:
   a. Loss of normal ac power
   b. Failure of battery charger
   c. Low battery capacity, alarming at 70 percent of battery capacity.
4. Any resulting trouble alarm shall be automatically transmitted to an approved central station or proprietary supervising station as defined in NFPA 72 and shall sound an audible signal at a constantly attended location.

B A sign shall be located at the fire alarm panel with the name and telephone number of the local Fire Department indicating that they shall be notified of any failures that extend past the 2-hour time limit.

C A dedicated supervised monitoring panel shall be provided at a location designated by the AHJ inside the facility to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:
1. Normal AC power
2. Signal booster trouble
3. Antenna failure
4. Loss of normal AC power
5. Failure of battery charger
6. Low battery capacity

PART 3 EXECUTION

3.1 PERMIT REQUIRED

A A permit must be obtained prior to the construction or modification of an ERRAS as required by Authorit(ies) having jurisdiction, IFC 510, and FCC regulations. A copy of the permit shall be posted visibly on the main active component, or at the point of primary system operation.

3.2 TESTING REQUIREMENTS AND PROCEDURES:

A Contractor shall perform signal level testing at the project site at following times during the construction process:
1. Preconstruction Tests: Tests performed with the AHJ prior to construction of the new facility to verify that the municipality has signal coverage in that area.
2. Mid-Construction Tests: Tests performed with the AHJ during construction, once walls have been constructed and the exterior roof and glazing is installed.
3. Final Testing: Tests performed in conforming with IFC Section 510.5.3 and Section 510.6. This testing is to be signed off by the AHJ. Engineers shall also be present for the final testing process.

B All tests shall be conducted, documented, and signed by a person in possession of a current FCC General Radiotelephone Operator License (GROL), or a technician certification issued by the Association of Public-Safety Communications Officials International (APCO) or equivalent as determined by the local Fire Marshal.

C Tests shall be made using frequencies close to the frequencies used by the Fire Department and appropriate emergency services. If testing is done on the actual frequencies, then this testing must be coordinated with the local Fire Department unit. All testing must be done on frequencies authorized by the FCC. A valid FCC license will be required if testing is done on frequencies different from the police, fire or emergency medical frequencies.

D For all proposed systems utilizing broadband amplification schemes, including bi-directional amplifiers, ambient signal levels measurements for nearby carriers (800 MHz consideration) in the adjacent SMR and cellular bands must be provided. This will ensure the amplifier will not be overdriven and create harmful interface.

E Ambient Signal Level Measurement:
1. A maximum amplitude plot (“Max Hold”) of signal strength (dBm) vs. frequency (MHz)
2. between 863 MHz and 880 MHz.
3. Perform measurement for at least ten (10) minutes during the hours of 7 AM – 7 PM, Monday through Friday.
4. Resolution Bandwidth shall be 10 KHz.
5. Place markers on any carrier measured over -55 dBm to readily identify signal strength and frequency. No more than three (3) markers are required.
6. Place one (1) marker on the active City/County 800 MHz control channel(s).
7. Prepare results electronically in a radio propagation format.

F Signal Strength Measurement Procedure:
1. Each floor of the building shall be divided into a grid of approximately 20 equal grid areas of a minimum of 20 feet and a maximum of 80 feet per grid to a maximum of 128,000 sf per level. For floors with more than 128,000 sf per floor, it will require that it be divided into grid sectors of no more than 20 grids per sector and tested individually per sector.
2. Minimum Signal Strength: For testing system signal strength and quality, the testing shall be based on the delivered audio quality (DAQ) system. A DAQ level below 3.5 shall be considered a failed test for a given grid cell.
3. Measurements shall be made with the antenna held in a vertical position at 3 to 4 feet above the floor to simulate a typical portable radio worn on the belt or turnout coat pocket.
4. All measurements shall be made in an averaged mode with sampling minimums as specified below:
    a. Average signal levels shall be recorded while walking an “X” pattern with the center of the pattern located approximately in the center of each grid area.
    b. The linear distance of each side of the “X” shall be 10 percent of the length of the grid’s side, and a minimum length of 10 feet. At least one sample per each five feet traveled shall be recorded, and no less than five samples per measurement recorded.
    c. A test location approximately in the center of each grid area will be selected for the test, then the radio will be enabled to verify two-way communications to and from the outside of the building through the public safety agency’s radio communications system. Once the test location has been selected, prospecting for a better spot within the grid area will not be permitted.
    d. A maximum of two nonadjacent areas will be allowed to fail the test. A failure occurs when the measured signal level falls below the minimums specified above.

3.3 EXAMINATION

A Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 INSTALLATION

A Distribution System Signal Wires and Cables:

1. Wires and cables shall enter each equipment enclosure, console, cabinet or rack in such a manner that all doors or access panels can be opened and closed without removal or disruption of the cables.
2. Wires or cables routed between consoles, cabinets, racks, and other equipment shall be installed in an approved conduit or cable tray that is secured to building structure.
3. Cable pathways, conduit, and cable support systems shall be complete with bushings, deburred, cleaned, and secure prior to installation of cable.
4. Before energizing the system, completely test all cables after installation and replace any that are found to be defective. Test for short circuits, ground faults, continuity, and insulation.
5. Install cables without damaging conductors, shield, or jacket.
6. Do not bend cables, while handling or installing, to radii smaller than as recommended by manufacturer.
7. Pull cables without exceeding cable manufacturer's recommended pulling tensions. Any pulling compounds utilized must be approved by the cable manufacturer.
8. In all exposed ceiling areas such as mechanical rooms, cable shall be fully enclosed in conduit.
9. Cable must not be fastened to electrical conduits, mechanical ductwork or piping, sprinkler piping, or routed to obstruct access to hatches, doors, utility access panels, or service work areas. Do not route cables through fire doors, ventilation shafts, grates, or parallel for more than four-feet with line voltage electrical conductors. System cables shall not be run loose on ceiling grid or ceiling tiles.
10. Each cable run shall be free of splices. No terminations, splices, or equipment will be installed in or above ceilings.
11. Do not route any communication cable within two feet of any light fixture, HVAC unit, service access area, electrical panel, or any device containing a motor or transformer.

B System Installation:

1. Coaxial antenna cabling shall not be installed in the same conduit, raceway, or cable trays used for other systems.
2. All equipment shall be connected according to the OEM's specifications to ensure correct installation and system performance.
3. Coordinate all roof penetrations with Owner and/or roofing contractor.

C Non-Interference

1. No radio signal amplifications system capable of operating on frequencies or causing interference on frequencies assigned to the jurisdiction by the FCC shall be installed without prior coordination and approval from the AHJ. The Owner shall suspend and correct other equipment installations that de-grade the performance of the ERRA.

3.5 DELIVERY, STORAGE, AND HANDLING

A Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.

C Handling: Protect materials from damage during handling and installation.

3.6 GROUNDING

A Ground cable shields and equipment per Manufacturer's requirements.

B Antenna mast shall be grounded per NFPA 70 NEC requirements, Division 27 Section "Grounding and Bonding of Communications Systems", and antenna manufacturer's requirements.

C Provide grounding blocks and surge protection for outside coaxial cabling.

D Bond the antenna mast to the lightning protection system (if applicable).

3.7 FIELD QUALITY CONTROL

A The local AHJ will review plans and specifications. Upon acceptance, plans will be stamped to indicate approval. Stamped plans are required to be present at the acceptance test. Any field changes that occur during construction shall be incorporated into new As-Built plans, including any manufacturer's data sheets for any equipment changes not submitted in the original submittal. As-Built plans, if required due to system changes, shall be submitted to the local AHJ for approval.

B Field tests shall be witnessed by the AHJ.

C Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visual Inspection: Conduct visual inspection prior to testing.
    a. Inspection shall be based on completed As-Built Drawings and system documentation.
2. Start-Up Testing:
    a. Refer to 'Testing Requirements and Procedures' above for signal strength measurement procedures.
    b. Testing of the system shall conform to the testing requirements as described in IFC Section 510.5.3.
    c. All testing must be done on frequencies authorized by the FCC and in use by local agencies as directed by the AHJ.
    d. Thoroughly test all components of the systems and devices proposed herein to assure equipment specifications are met. This contractor will start up, test, and debug systems to ensure that all aspects of the system are working, documented, and reporting properly.
    e. Active components shall be tested to establish initial system gains of equal value to those of design criteria. During subsequent inspections, gain values shall be measured to ensure values equal to those at time of final acceptance.
3. Final Acceptance Testing:
    a. Refer to 'Testing Requirements and Procedures' above for signal strength measurement procedures.
    b. All acceptance testing shall be done in the presence of a local AHJ representative and the Owner.
    c. Small scale drawings (11-inch x 17-inch) of the structure shall be provided by the Contractor to the Owner. The plans shall show each floor divided into the grids as described above, and the results of the pre-testing. Each grid shall be labeled to indicate the DAQ result from the final acceptance testing.
    d. The Contractor shall provide the latest approved plans for the system, including any manufacturer's data sheets for any equipment changes not submitted in the original submittal to the Owner.
    e. Acceptance testing shall include testing results of the repeater (output wattage, gain level, etc.) and connection to the fire alarm.

E Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F Radio system will be considered defective if it does not pass tests and inspections.

G Prepare test and inspection reports.

H Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I Annual Test and Inspection: One year after date of Substantial Completion, test radio system. Use forms developed for initial tests and inspections.

3.8 ANNUAL TESTING

A Annual tests shall be the Owner's responsibility. All live components of the system, such as signal boosters, power supplies, and backup batteries shall be tested at a minimum of once every 12 months. Owner shall maintain documentation at the request of the AHJ.

1. The re-testing will be done at no expense to the AHJ or the appropriate emergency services departments as required in the original testing procedures.

B See testing section above for qualifications of person(s) performing annual testing.

C Fire Department Radio personnel, after providing reasonable notice to the Owner or their representative, shall have the right to enter onto the property to conduct field testing to be certain that the required level of radio coverage is present.

3.9 SERVICE MAINTENANCE CONTRACT

A Provide a maintenance contract with a Radio Service Provider with name of authorized company, who will provide a 24-hour by 7-day emergency response within two (2) hours after notification. The system shall be maintained in accordance with FCC requirements. The contract shall be for five (5) years.

B Maintain a list of contact personnel with phone numbers at the radio repeater system cabinet. The contact personnel shall have knowledge of the building and the repeater system and be available to respond to the building in the case of an emergency.

C Radio Service Provider maintenance contract shall include but not be limited to the following:

1. Annual Test:
    a. All active components of the distributed antenna system, including but not limited to amplifier, power supplies, and back-up batteries, shall be tested a minimum of once every 12 months.
    b. Amplifiers shall be tested to ensure that the gain is the same as it was upon initial installation and acceptance. The original gain shall be noted and any change in gain shall be documented.
    c. Back-up batteries and power supplies shall be tested under load for a period of 1 hour to verify that they will operate during an actual power outage.
    d. Active components shall be checked to determine that they are operating within the manufacturer's specifications for their intended purpose.
    e. Documentation of the test shall be maintained on site and a copy forwarded to the local Fire Department Radio Supervisor upon completion of the test.

3.10 TRAINING

A On-site training sessions shall be conducted by the ERRAS Contractor. It shall be the responsibility of the Contractor to coordinate time and location of training sessions with the Owner. Provide documented general instruction as follows:

1. Provide instruction to the maintenance personnel to include the location, inspection, normal maintenance, testing and operation of all system components. Provide a minimum of four (4) hours, two (2) 2-hour sessions separated by a minimum of two (2) weeks.
2. Provide instruction to designated personnel on the functions and operation of the system provided including capabilities, limitations, and the meaning of status messages. State the proper procedure for testing, routine maintenance, and request for service. Provide detailed instruction on the operation of the system. Provide a minimum of four (4) hours, two (2) 2-hour sessions separated by a minimum of two (2) weeks.

END OF SECTION

SECTION 28 13 00 – ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This section identifies the requirements, technical design, and specifications for the access control system at the Fort Bend ISD Willowridge HS Fine Arts Addition and Renovation, located in Houston, Texas ("Owner"). The access control system as specified is an Industry-Standard access control system and it shall be an extension of the District's existing system and includes (existing) access control server, (existing) access control software, control panels, card readers, credentials, cabling, power supplies, and any associated software, hardware, or licensing as specified.

B. It is the Contractor's responsibility to review this specification and associated project specifications and drawings in their entirety, prior to bidding on the project. By bidding on this project, the contractor acknowledges that they have read and fully understand these specifications, with no exceptions. Contractor shall review the drawings, specifications, and existing conditions prior to bidding on the project. Any discrepancies shall be brought to the attention of the Architect / Design Consultant via request for information (RFI) in writing for evaluation and or clarification. If these items are not brought to the attention of the Architect / Design Consultant the more costly or difficult manner, and the better quality or greater quantity of work shall be provided by the contractor in accordance with the Architect's / Design Consultant's interpretation at no additional cost to the owner.

C. Contractor shall furnish and install all materials, equipment, and labor necessary to provide a complete and functional turn-key access control system regardless of any items not listed or described in this specification or associated drawings.

D. Requirement Sections Table of Contents

1. 1.3 Contractor Experience Requirements
2. 1.4 Submittal Requirements
3. 2.1 Products – General Requirements
4. 2.2 Acceptable Manufacturers
5. 3.1 Codes, Standards and Regulations
6. 3.2 Execution - General Requirements
7. 3.3 Coordination Requirements
8. 3.4 System Requirements
9. 3.5 Testing Requirements
10. 3.6 Training Requirements
11. 3.8 Substantial Completion
12. 3.9 Project Closeout Documentation

1.2 RELATED REQUIREMENTS

A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 1 apply to the work specified in Division 28 and shall be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.

1.3 CONTRACTOR EXPERIENCE REQUIREMENTS

A. The Contractor shall be a certified DSX Access Control System Partner prior to submitting a bid for the work.

B. The Contractor shall possess all relevant DSX Manufacturer Certifications (i.e., access control systems, hardware installation, software installation and programming) for both the company and individual technicians prior to submitting a bid for the work.

C. The Contractor shall have a DSX manufacturer certified technician onsite throughout the duration of the installation phase of the project.

D. The Contractor's Project Manager shall be dedicated to this project for the duration of the project and shall be available for all onsite coordination meetings.

E. The Contractor shall have been in business for a minimum of five (5) years.

F. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a 75-mile radius of the project site.

G. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.

H. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

1.4 SUBMITTAL REQUIREMENTS

A. Bid / Proposal Submittal

1. Contractor shall provide as part of their bid/proposal:
2. Breakdown of proposed parts and labor required for the completion of the project. Include documentation showing annual licensing cost of ownership.
3. Proposed construction schedule in a Gant chart format
4. Contractor Safety Plan detailing safety practices around the jobsite.
5. Contractor QA / QC process detailing processes and procedures to ensure quality workmanship during installation and troubleshooting.
6. A detailed description of the installation team(s) that would perform the work.
7. A resume for each of the key project personal.
8. Licensed in the State of Texas.
9. Contractor is responsible for procuring all applicable access control permits required for this project with Fort Bend County / Fire Marshall.
10. Submitting Contractor must be certified to install products and services for systems they are proposing. No subcontract of services will be allowed for any security scope of work. Contractor must submit to the Owner prior to starting any work the factory training certifications for all personnel that will be working on the system.

B. Pre-Installation Submittal

1. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Architect / Design Consultant.
2. The Contractor is responsible for notifying and obtaining written approval via RFI from the Architect / Design Consultant / Owner of any proprietary devices, software, and/or installation processes.
3. Contractor is responsible for obtaining permitting as required in accordance with the authority having jurisdiction (AHJ), local, city, state, federal, and/or applicable law requirements.
4. Contractor shall ensure submittals are submitted within 15 business days of award to ensure all products can be ordered and received on site in order to not cause any delays. Any products having long lead times (more than 60 days) that may negatively impact the schedule shall be clearly identified in writing so the review and approval can be expedited.
5. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e., product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product

certifications for installers, etc.). Submittals not in the proper sequence will not be approved.

6. Contractor shall provide the following as part of their submittal:

   a. Manufacturer product data sheets for each proposed system component.
      1) For product data sheets containing more than one (1) part number or product, the Contractor shall clearly identify the specific part number or product being submitted. Product data sheets without the part number clearly identified will not be approved.
      2) Contractor shall identify any products that are discontinued, end of life, or near end of life, and shall propose equal alternate to the discontinued product in writing.

   b. Manufacturer Product Certifications for Company.
   c. Manufacturer Product Certifications for Installers.
   d. Manufacturer Warranty letters.
   e. Documentation indicating that Contractor has been in business for (5) years.
   f. Address of Contractor's local office within a 75-mile radius of the project site.
   g. Quantity of full-time, local technicians within a 75-mile radius of the project site.
   h. List of five (5) contractor-installed projects of a similar size and scope that have been in operation for at least (1) year. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, Brief Description of Project, Client Point of Contact Name and Phone Number.
   i. List of completed and ongoing projects with the Owner. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, and Brief Description of Project.
   j. List of subcontractors performing any work on the project. List shall clearly identify the subcontractor's legal name and address, the scope of work to be performed by the subcontractors and the overall percentage of the project being provided by the subcontractor. If there are no subcontractors performing any work on the project, submit a statement on company letterhead clearly indicating no subcontractors will be performing any work on this project.
   k. Manufacturer's certification letter confirming that the proposed access control system components do not have any known cybersecurity notices, bulletins, or alerts. If a vulnerability is discovered, the contractor shall notify the Architect / Design Consultant within 24 business hours. Provide the make and model of the associated equipment and the vulnerability.
   l. Manufacturer cybersecurity hardening guide. If one is not available, provide documentation from the manufacturer stating such.
   m. A complete set of shop drawings to include at minimum but are not limited to:
      1) Proposed and/or samples of original contractor security schedules. Schedules are <u>not</u> to be copy/paste of schedules provided within the contract documents. Schedules proposed shall be utilized as part of As-Built drawings in coordination with Div. 27 for additional information as required for network components.
      2) Device and equipment schedules shall include at a minimum but are not limited to:
      3) Device Label
      4) Device Type
      5) Device Power Requirements
      6) Terminating MDF / IDF / Panel Location

   n. Additional networking information as required to include:
      1) Rack
      2) Network switch
      3) IP addresses
      4) Patch panel
      5) Surge/lighting protection.
      6) Power source

o. Elevation and Topography Drawings to illustrate the associated devices and equipment and the heights at which they will be installed.
p. Signal Flow Diagram including full security topology.
q. Supplemental documents to include at a minimum but are not limited to:
    1) Contractor Safety Plan detailing steps Contractor will take to ensure a safe work environment.
    2) Contractor QA/QC Document to include bench testing / initial configuration of all critical system components including but not limited to:
    3) System Server(s)
    4) Cameras
    5) Contractor Furnished Workstations (if applicable)
    6) Construction Schedule in a Gant chart format
    7) Contractor Cybersecurity Hardening Guide detailing Contractor's internal policies for preventing the introduction of cyberthreats to the Owner's technology / security infrastructure.
    8) Contractor Certification Letter utilizing company letterhead detailing the company policies and procedures.
    9) Contractor shall provide a cybersecurity plan detailing their internal policy for preventing the introduction of cyberthreats to the Owner's technology / security infrastructure.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The following sections specifically list the acceptable equipment types and items for this project.

B. All software, hardware, and equipment (from the date of RFP) shall be tested, currently available and commercially off the shelf product. (COTS).

C. All wiring, equipment, and installation materials shall be Commercial Grade, new, and of the highest quality to meet or exceed the performance and features of the equipment and devices specified herein.

D. Written approval must be obtained from the Architect / Design Consultant / Owner for any proprietary or custom software and/or equipment prior to the beginning of the project.

E. All devices shall be installed with the manufacturer recommended mounts and accessories as necessary for the installation locations type as scheduled.

F. Unless otherwise stated, all software and licensing shall be for the most current, up to date version of the system provided. For existing systems, Contractor shall obtain written verification of the Owner's most current software version and notify via RFI the Architect / Design Consultant / Owner if implementation of the most current software / license version will require an upgrade to the Owner's existing system.

G. Architect / Design Consultant / Owner will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.

H. Proposed equivalent items must be approved in writing by the Architect / Design Consultant / Owner prior to purchase or installation. Proposed equivalent items must meet or exceed these specifications and the specifications of the specified item.

I. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall submit a formal RFI for an appropriate substitute.

J. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished at no additional cost to the owner.

K. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.

L. Labels on all cabling, materials, and equipment must indicate a nationally recognized testing laboratory.

M. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Architect / Design Consultant / Owner. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues, and the Contractor will have all products on-site when needed to complete the job as per the project schedule.

1. Any quantities listed are for reference only, contractor is responsible for furnishing materials as required to provide a fully functional turkey system. Where quantities are not noted, Contractor shall refer to drawings and schedules to determine exact quantities.

2.2 ACCEPTABLE MANUFACTURERS

A. Access Control System Manufacturers

1. DSX

B. ACS Server

1. WinDSX Access (Existing, Owner provided.)

C. Access Control Software

1. WinDSX Access (Existing, Owner provided.)

D. ACS License

1. Contractor to provide licensing as required.

E. Client Workstation

1. Owner Furnished; Owner Installed

F. Badging Workstation

1. Owner Furnished; Owner Installed

G. Badging Printer

1. Owner Furnished; Owner Installed

H. Intelligent Controllers

1. DSX-1042PKGNV (Master)
2. DSX-1048PKG
3. DSX-1042PKG

I. Door Controllers

1. DSX-1042

J. Input Controller

1. DSX-1044

K. Output Controller

1. DSX-1043

L. Communication Module

1. DSX-IP-HUB (Master)
2. DSX-LAN (Master & Sub Panel)

M. ACS Panel Power and Lock Supply

1. DSX-1040PDP Power Distribution Panel with DSX-SP320-27

N. ACS Power Supply Battery

1. 12V 7AH Battery (2) per Power Supply

    a. Yuasa
    b. Or approved equal.

O. Card Reader

1. Wall Mount

    a. HID Proximity ThinLine II 5395 (Black)

2. Mullion Mount

    a. HID ProxPoint Plus 6005 (Black)

P. Door Contact

1. Recessed SPST

    a. GRI 180-12
    b. GRI 195-12 (DPDT)
    c. Or approved equal.

2. Surface Mount with armored cable

    a. GRI- 4402-A
    b. GRI 4405-A (DPDT)
    c. Or approved equal.

Q. Request to Exit

1. Unless otherwise noted, the request to exit shall be integral with the electrified door hardware. Reference Section 08710 - Finish Hardware.

    a. Request to Exit – PIR Motion Sensor (used on Electric Strike access-controlled doors)
        1) Bosch DS160
        2) Or approved equal.

R. Access Cards

1. Contractor shall provide (100) access control cards. Coordination with Fort Bend ISD Design Manager is required for the exact type.

S. Door Release, Duress, Panic and Lockdown Button

1. Latching Hold-up Switch

a. HUSK20

2. Door Release Button Momentary

a. HUB-2SA

3. Lockdown Blue Mushroom Button - Wall Mount with Cover

a. STI SS2421LD-EN
b. Or approved equal.

T. Access Control System Cabling

1. Lake Cable (Color Orange, Plenum Rated, Cable shall be sized based on length).

a. Card Reader – 22 AWG / 6-Conductor (Shielded)
b. Lock Power – 18 AWG / 4-Conductor
c. Request to Exit – 18 AWG / 4-Conductor
d. Door Contact – 22 AWG / 4-Conductor
e. Door Release Button - 18 AWG / 4-Conductor
f. Lock Down Button - 18 AWG / 4-Conductor.
g. Video Intercom Input / Output - 18 AWG / 4-Conductor.
h. RS-485 (Twisted, Shielded)
i. RS-232 (Twisted, Shielded)
j. Or approved equal.

U. Outside Plant Cables (Cable shall be sized based on length).

1. Card Reader – 18 AWG / 6-Conductor (Shielded)
2. Gate Controller - 18 AWG / 4-Conductor
3. Lock Power – 16 AWG / 2-Conductor (Minimum) Contractor shall size cable gauge per manufacturer’s distance parameters.
4. Or approved equal.

V. Video Intercom

1. AiPhone – IX Series 2

a. Master Station (PoE)
1) IX-MV

b. Video Door Station (PoE)
1) Mullion Mount
2) IX-DVM

c. Input/Output Network Adaptor (PoE)
1) IXW-MA

2. AiPhone Intercom System Cabling

a. By Division 27 10 00 Structured Cabling System
b. IP Intercoms – Category 6 Plenum rated - White Cable Jacket (By Others).

W. Pathway Cable Support

1. Panduit J-Mod Cable Support System
2. Erico – CADDY CAT LINKS J-Hook Series
3. Panduit Plenum Rated Hook & Loop (Black)

X. Labeling

1. Permanent Labels for Copper Cables

a. Panduit Self-Laminating Labels
b. Or approved equal.

Y. Fire Stop

1. STI Spec Seal
2. 3M Products
3. Or approved equal.

PART 3 - EXECUTION

3.1 CODES, STANDARDS, REGULATIONS

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

1. ASTM B 1 (2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
2. ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
3. ASTM D 1557 (2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
4. ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

C. Alliance for Telecommunications Industry Solutions (ATIS)

D. Building Industry Consulting Service International (BICSI)

1. Telecommunications Distribution Methods Manual 13th Edition
2. Outside Plant Design Reference Manual 5th Edition
3. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
4. NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling
5. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

E. Federal Communications Commission (FCC)

1. FCC Part 15, Radiated Emissions Limits, revised 1998.
2. FCC Part 68, Connection of Terminal Equipment to the Telephone Network, revised 1998
3. FCC Part 76, Cable Television Service, revised 1998

F. Insulated Cable Engineers Association (ICEA)

1. ICEA S-87-640 (2006) Fiber Optic Outside Plant Communications Cable
2. ICEA S-98-688 (2006) Broadband Twisted Pair, Telecommunications Cable Aircore, Polyolefin Insulated Copper Conductors

3. ICEA S-99-689 (2006) Broadband Twisted Pair Telecommunications Cable Filled, Polyolefin Insulated Copper Conductors

G. International Electrotechnical Commission (IEC)

H. Institute of Electrical and Electronics Engineers, Inc. (IEEE)

1. IEEE Standard 81-1983, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System
2. IEEE Standard 1100-1999, Recommended for practice for Powering and Grounding Sensitive
3. Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)
4. IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code
5. IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms

I. International Organization for Standardization (ISO)

1. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)
2. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
3. ISO/IEC 14443-3:2011 – Identification Cards
4. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999

J. National Cable Television Association (NCTA)

K. National Electrical Contractors Association (NECA)

1. NECA 1-2015 Good Workmanship in Electrical Construction

L. National Electrical Manufacturers Association (NEMA)

1. NEMA C62.61 (1993) Gas Tube Surge Arresters on Wire Line Telephone Circuits

M. National Fire Protection Association (NFPA)

1. NFPA-70, National Electrical Code
2. NFPA-75, Protection of Electronic Computer Data Processing Equipment.
3. NFPA-101, Life Safety Code
4. NFPA-297, Guide on Principles and Practices for Telecommunications Systems
5. NFPA-780, Standard for the Installation of Lightning Protection Systems.

N. National Institute Standards and Technology (NIST)

O. Occupational Safety and Health Administration (OSHA)

P. Security Industry Association (SIA)

Q. Telecommunications Industry Association (TIA)

1. ANSI/TIA-568.0-D-1, Generic Telecommunications Cabling for Customer Premises.
2. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard.
3. ANSI/TIA -568.0-D.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard.
4. ANSI/TIA-568.3-D-1, Optical Fiber Cabling Components Standard.
5. ANSI/TIA–569-E Commercial Building Standard for Telecommunications Pathways and Spaces.
6. ANSI/TIA-606-C, Administration Standard for the Telecommunications Infrastructure.
7. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.

8. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.

R. U.S. Department of Agriculture (USDA)

1. RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment and Construction
2. RUS Bull 1751F-643 (2002) Underground Plant Design
3. RUS Bull 1751F-815 (1979) Electrical Protection of Outside Plant
4. RUS Bull 1753F-201 (1997) Acceptance Tests of Telecommunications Plant (PC-4)
5. RUS Bull 1753F-401 (1995) Splicing Copper and Fiber Optic Cables (PC-2)
6. RUS Bull 345-65 (1985) Shield Bonding Connectors (PE-65)
7. RUS Bull 345-72 (1985) Filled Splice Closures (PE-74)
8. RUS Bull 345-83 (1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)

S. Underwriters Laboratories, Inc. (UL)

1. UL 294 Standard for Access Control System Units
2. UL 294B Standard for Power Over Ethernet (PoE) Power Sources for Access Control Systems and Equipment
3. UL 109 Standard Method for Flame Tests of Flame-Resistant Fabrics and Films
4. UL 1076 Standard for Proprietary Burglar Alarm Units and Systems

3.2 EXECUTION - GENERAL REQUIREMENTS

A. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), State of Texas, the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the aforementioned laws, ordinances, and rules, the matter shall be referred to the Architect / Design Consultant for direction before proceeding with that part of the work.

B. Contractor shall meet the specifications and standards from the latest NFPA and NEC publications. In the event of any conflicts between Standards and Codes the more stringent shall take precedence.

C. The Contractor shall install the materials in accordance with these specifications and the manufacturer’s installation guidelines. Equipment and materials installed by the Contractor shall be free of defects and damage.

D. No deviations from the plans, details or specifications shall be made without full consent in writing of the Architect / Design Consultant. The Contractor shall have written approval from the Architect / Design Consultant for any additional work beyond the Contract Documents prior to beginning such work.

E. Prior to execution, Contractor shall verify no changes in software, licensing or hardware versions have occurred since the bidding of the project. In the event of any changes, Contractor shall verify system compatibilities with their proposed design and notify via RFI the Architect / Design Consultant / Owner if the newest version(s) will require any upgrades / additional costs to the existing system(s).

F. In the event site conditions do not allow the contractor to follow the execution requirements specified herein or in the provided details, the Contractor shall submit via RFI an alternative means and methods that is approved in writing by the Architect / Design Consultant.

G. The Contractor shall obtain written permission from the Architect / Design Consultant before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to girders, beams, floors, walls, roofs, and/or ceilings.

H. If the Contractor does not obtain written approval from the Architect / Design Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.

I. Contractor shall notify the Architect / Design Consultant a minimum of (2) weeks prior to beginning work and will participate in a pre-construction meeting with the Architect / Design Consultant to perform a walkthrough, review the scope of work, schedule, and escalation procedures.

J. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap cable, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.

K. Contractor shall be responsible for the repair of any damage caused by the contractor during the installation.

L. Contractor shall test all cables prior to and post installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.

M. Contractor shall maintain a set of working specifications, design drawings, and record drawings to be kept on site at all times and shall update the record drawings with any changes on a weekly basis. Record drawings shall be made available for inspection at the request of the Architect / Design Consultant.

N. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.

O. Equipment and materials shall be delivered and stored in accordance with the manufacturer's guidelines at the Contractor's expense.

P. Contractor shall make all stored equipment and materials available for inspection at the request of the Architect / Design Consultant.

Q. All equipment and material used in the installation shall be approved by the manufacturer for the environment in which it is being installed.

R. All devices shall be installed flush, plumb, and (where required) centered on the wall, ceiling tile or structure for which it is being installed, unless otherwise noted.

S. Devices installed in public spaces shall be mounted and secured using tamper-proof security fasteners unless otherwise noted.

T. Cables shall be properly supported in accordance with industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.

U. Contractor shall be responsible to properly protect information outlets from damage by other trades during construction.

V. Cables shall be routed at 90-degree angles to the building structure. At no time shall a diagonal pull be installed.

W. The Contractor shall not install cables in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be removed and replaced at no cost to the Owner.

X. The manufacturer and contractor shall take positive measures to prevent the introduction of cybersecurity threats to the Owners technology infrastructure. These measures shall include but are not limited to:

1. The contractor shall scan contractor owned equipment for cyber threats such as viruses, malware, ransomware, etc., prior to connecting the contractor owned devices to the Owners network.
2. Ensure all technicians installing or configuring equipment are trained in the prevention of introduction of cyber threats to electronics, i.e., servers, and other associated equipment.
3. All project documents shall be properly securely stored behind encryption and password protection to avoid unauthorized distribution of documents.

Y. Labeled Doors and Frames

1. In no instance shall any UL labeled door or frame be drilled, cut, penetrated, or modified in any way.
2. The Contractor shall be responsible for replacing any labeled door or frame that is modified without written approval from the Architect.

3.3 COORDINATION REQUIREMENTS

A. The Contractor is responsible for the coordination of the following items and their respective disciplines included but not limited to.

B. Coordinate with the Architect to ensure that:

1. Adequate conduit is provided and that equipment backboxes are adequate for system installation.
2. Adequate power has been provided and properly located for the security system equipment.
3. Doors and door frames are properly prepared for electric locking hardware and door position switches.
4. Access hatch locations (when required) shall be submitted in writing via RFI and coordinated with the Architect.
5. Finishes and colors of all equipment visibly installed in public areas. Submit all finish and graphics for all equipment to the Architect for approval prior to installation.

C. Coordinate with the Division 8 contractor for the following:

1. Door hardware manufacturer installation and power requirements.
2. Installation, power, and requirements for integral request to exit switches.

D. Contractor is responsible for coordinating gate controller installers for controller locations and interfacing terminations.

E. Coordinate with the Division 26 contractor for the following:

1. Power requirements, conduit sizes/pathways, sleeves, back boxes, grounding, and bonding requirements of security devices in the following locations:
2. Interior of the building
3. Exterior of the building
4. Pole, pedestals, canopies, awnings, building architectural surface, etc.
5. Special conditions (clean room, hazardous areas, roof top mounted devices, etc.).
6. Coordinate location and termination of earth ground for all device specified herein as required per manufacturer installation requirements.

F. Coordinate with the Division 27 contractor for the following:

1. Installation and power requirements of network infrastructure associated to the specified system.
2. Associated patch cable lengths and quantities required for the specified system.
3. Location, power, and backup requirements for rack mount equipment.

G. Coordinate with the Division 28 (Fire) contractor for the following:

1. Door hardware manufacturer installation and power requirements associated with fire alarm system(s).
2. Door hardware manufacturer installation and power requirements for all ACS electric locking mechanisms with time-delay (“delayed egress”) functions as defined by NFPA 101.

H. The Contractor is responsible for coordinating ACS locations and mounting preferences of all specified security devices with the Architect / Design Consultant prior to installation.

I. The Contractor is responsible for coordinating all ACS programming requirements with the Owner / Architect / Design Consultant.

J. The Contractor shall coordinate with the Owner for the following:

1. Network IP addressing for networked system equipment, controllers, and devices.
2. Device labeling scheme
3. Firmware/software updates
4. Client workstations requirements and locations
5. Location of rack mount equipment.
6. Locations, type, programming, configuration, and Owner’s final expectations for any Contractor Furnished Contractor Installed (CFCI) equipment and devices.
7. Uninterruptible Power Supply (UPS) requirements.
8. Painting of exposed, publicly visible conduit pathways
9. Credential reader card formats, LED, buzzer and associated visual/audio functionalities.
10. When required, credential card ordering, formats, facility codes, barcode and template requirements or standards prior to installation. Coordinate timelines for delivery and distribution of the credentials to the Owner prior to procurement.

3.4 SYSTEM REQUIREMENTS

A. General

1. The Access Control System (ACS) shall consist of server(s), software, licensing, workstations, doors controllers, access control cabling, credentials and all other peripheral components as indicated in the drawing and specified herein.
2. Any devices associated with the installation shall have the latest firmware updates downloads via owner approved secure link from the system software and/or remotely from the manufacturer.
3. All Access Control software, equipment and system requirements shall be installed per their respective Manufacturer Installation Guidelines.
4. Programming and data entry to be provided by the Contractor. Contractor shall program the Access Control System to provide the following basic functions included but not limited to:

    a. Database Importing (Active Directory, CSV file, etc.)
    b. Graphics Maps
    c. Time zones
    d. System Reports
    e. Threat / Emergency Management Protocols (Lockdown, Severe Weather, etc.)
    f. Role Based User System Access (Admin, User Privileges, etc.)
    g. Access levels (Areas, Floor Groups, User Groups, etc.)
    h. Schedules (Lock/Unlock, Auto Arm/Disarm, etc.)
    i. Auxiliary I/O Devices (Sirens, Strobes, Buzzers etc.)
    j. Door Configuration Settings to include but not limited to:
        1) Anti-Pass Back
        2) Door Release via Push Button Input
        3) Door Release via Request to Exit (Maglock ONLY)
        4) Door Forced / Door Held Alarms Conditions
        5) ADA Door Settings

k. Special Conditions (Fire Alarm Relays, Hold Opens, Elevators, Gate / Door Operators, etc.)

5. When programming and data entry for the system is to be completed by Owner, Contractor is responsible for initial programming to ensure the installed field devices, media converters, etc., are communicating to the head-end equipment, so that the Owner can complete the necessary programming and shall assist in troubleshooting in the event they do not.

B. Access Control System (ACS) Software

1. Application / Client Workstation Software

a. The ACS software shall be installed as the most current version; contractor shall coordinate with owner prior to the upgrade/install to identify and evaluate any software conflicts. Conflicts shall be brought to the attention of the design team prior to bidding via Request for Information (RFI). Contractor shall coordinate the installation and configure software on workstation(s) as required to provide a full turnkey ACS system.

C. Access Control System Licensing

1. Contractor shall be responsible for providing and applying all necessary licensing key(s) for the specified system(s) as required by the manufacturer(s) for a fully functioning access control system.
2. Contractor shall maintain a secured document with all license key(s) information applicable to this project. All license key(s) are property of the owner and shall be kept secured at all times and then surrendered to the Owner at the end of the project.

D. Access Control System Hardware

1. ACS Server

a. Existing

2. Communications

a. Communication between servers, and workstations, networked based controllers/sub-controllers will communicate using the Owner provided data network unless otherwise noted. Coordinate with owner for network configuration requirements.
b. The ACS shall also support end to end 128-bit encryption unless otherwise noted.
c. Alternative communications means and methods shall be provided by Division 28 where applicable.

E. Access Control Workstations

1. Operator/Client Workstation

a. OFOI

2. ID Badge Printing Workstation

a. OFOI

3. Access Control System Controller(s)

a. Install Controller(s) in designated MDF / IDF / Mechanical room(s) as indicated on drawings.

1) The Controller(s) shall be wall mounted in the ACS manufacturer's UL listed enclosure, unless a separate manufacturer enclosed power supply solution is specified that is specifically designed for the controller board(s) specified herein. The enclosure shall consist of the following.
   a) Single cover, hinged, with identical key cylinder lock(s) for all enclosure(s). Hinged double doors will not be accepted.
   b) Contractor shall furnish, install, and connect tamper switch for all enclosure(s) to the controller(s) as specified. One alarm input is needed per MDF/IDF/Mechanical to alarm via the ACS system when the enclosure is opened.
   c) Contractor shall furnish, install, and connect Battery Fail/Power Loss alarm inputs to the controller(s) as specified. One alarm input is needed per MDF/IDF/Mechanical to alarm via the ACS system in the event of low battery/power loss conditions.
   d) Enclosure(s) shall be mounted flush, plumb, and properly secured on fire-rated plywood using appropriate mounting hardware. Pathways to or from the enclosure(s) shall be mechanically protected in a conduit or gutter system. Exposed cabling is not permitted.

b. Device power shall be provided from a UL listed power supply or PoE powered network switch where required in accordance with the manufacturer's requirements.
c. Controller(s) shall be installed per the construction documents.
d. Controller(s) shall be installed and configured in accordance with the most current manufacturer installation instructions.
e. The installation shall be performed or directly supervised by a manufacturer-certified technician.
   1) The term "supervised" means the certified technician shall be on-site and supervising the installation.
   2) The certified (on-site) technician shall have a copy of the manufacturer certification on-site readily available for review.
   3) The manufacturer certification shall be current and valid.

F. Access Control System Card Readers

1. Provide card reader(s) as indicated on the drawings.
2. Readers shall be securely mounted flush and plumb on the wall/mullion per the manufacturer installation guidelines.
3. Exterior card readers shall be installed with a weather-proof gasket as recommended by the manufacturer.
4. Exterior card readers mounted on gates or vehicle pedestals shall be securely mounted in a NEMA rated weather-proof enclosure.
5. Where a weather-proof gasket is not sufficient for weather-proof protection, a polyurethane sealant for exterior use shall be applied.
6. Readers shall be installed with the manufacturer provided tamper-proof security fasteners, unless otherwise approved in writing by Architect / Design Consultant. If tamper-proof security fasteners are not provided, the contractor is responsible for procuring the requested hardware at no cost to the owner.

G. Access Control System Credentials (Cards, Vehicle Tags, PIN, Biometric)

1. All credential cards shall be surrendered to the owner in their original packaging after procurement.
2. Template / Card Format / PIN numbers.

   a. Security Contractor shall coordinate PIN number assignment with the Owner prior to any programming.
   b. Security Contractor shall maintain a digital record of all Template / Card Format / PIN numbers to be secured at all times, and then provide to Owner at Project Close-Out.

3. Unless otherwise directed, the contractor is responsible for the mounting of vehicle tags. Contractor shall confirm with the Owner the placement of interior / exterior vehicle tags in writing.

H. Door Position Sensors (Door Contacts, Tamper Switches)

1. Provide magnetic concealed door position switches, surface mount door position switches and overhead door position switches to monitor the open/closed status of doors as specified herein and as indicated on the drawings.
2. The contractor shall ensure the circuit of the door position sensor shall match the physical status of the door opening i.e., Normally Closed when the door is closed.
3. Exterior mounted door position sensors shall terminate using the appropriate outdoor-rated weatherproof connections and fasteners based on site conditions.
4. Provide flexible metallic conduit (as required) from the sensor location to the associated junction box as indicated on the drawings. Conduit shall be securely fastened to the structure using proper fasteners based on site conditions.
5. Contractor must ensure adequate spacing between contact and magnets to avoid abrasion / damage to the device.
6. Install end of line resistors for line supervision. Refer to manufacturer for recommended resistance values.
7. Tamper shall be mounted inside the enclosure on key switch side.

I. Request-to-Exit

1. For doors equipped with electric locking mechanical that are free exiting at all times (i.e., mortise electric locks, electric strikes, etc.), the REX motion sensor shall only shunt the door position sensor from the Access Control System unless otherwise noted.

    a. Integrated in Electrified Door Hardware
        1) Security Contractor shall route cable from door controller to access controlled door as indicated on the drawings and terminate the specified cable to the top of the Division 8 installed Electrified Power Transfer Hinge.
            a) At the time of installation of the door hardware, The Security Contractor shall provide and install all end of line resistors required by the PACS System Manufacturer.
            b) Security Contractor shall not remove Division 8 Installed Door Hardware unless otherwise approved in writing by the Architect / Design Consultant.

    b. Request-to-Exit Motion Sensor
        1) Motion sensor shall be mounted flush, plumb, and properly secured on a single gang box or mechanical brace using appropriate mounting hardware and trim plate.
        2) Motion sensors shall be positioned close to the door opening and angled to prevent tampering from forced entry. Contractor shall ensure devices mounted in the ceiling space are not obstructed or impacted when servicing in relation to other ceiling mounted devices (Exit signs, smoke detectors, lighting fixtures, etc.)

J. Door Release / Lockdown

1. Security device cabling installed in the knee space shall be mechanically protected with an armored flex from the rough-in back box to the edge device as scheduled. No exposed cabling is permitted.

    a. Door Release / Lockdown shall be wired to the Access Control System input boards as scheduled.
        1) The Door Release / Lockdown button shall be mounted flush, plumb, and properly secured as scheduled.
            a) The Door Release button shall be configured as momentary.

b. Duress buttons shall be installed under desk in the reception area and the principal's desk.
   1) Duress button shall alert Fort Bend ISD Police Department.
   2) Provide desk-mounted or wall mounted personnel duress alarms with normally closed alarm output contacts as indicated on the drawings.

c. Lock down button shall be located by the fire alarm panel inside the Administration area.
   1) Lockdown shall be wired to the Access Control System input boards as scheduled.
   2) Duress / Lockdown button shall be mounted flush, plumb, and properly secured as scheduled.
   3) The Lockdown button shall be configured as latching.
      a) Security Contractor shall configure lockdown button when pressed to close and lock Classroom pod/wing in order to secure each pod/wing independently in the case of a lockdown.
      b) will be the responsibility of the Security Contractor to coordinate with the Fire Alarm Contractor to configure/program all the doors at Classroom pod/wing with magnetic hold open configuration should allow for the ability to secure each pod/wing independently in the case of a lockdown. This can be accomplished with doors that separate these areas and that are tied to the lockdown system.

K. Access Control Intercom Systems

1. Unless otherwise stated, all intercom configurations shall be Contractor Programmed.
2. Intercom shall be configured to dial the associated handset unless otherwise stated.
3. Door Release via the PACS shall be initiated through programming and relay cabling from the intercom / intercom master station to the associated door relay board.
4. Coordinate audio recording requirements from intercom systems.

L. Electrified Door Hardware Mechanical Connections (Division 8)

1. Contractor shall conceal security cabling in door frame, door channels, walls wherever possible. Submit RFI if site conditions do not allow and propose alternative methods of terminations.
2. The Division 28 Contractor shall not make any modifications to fire rated doors without obtaining written permission from the Architect.
3. The Division 28 Contractor is responsible for providing the following:

   a. Provide relay signal cabling only from the ACS to the Division 8 power supply or relay board(s) located either at the door or centralized location.
   b. Termination of Lock Relay Power for PoE based networked door controllers up to the electrified door hardware.
   c. Device power provided by Owner-provided PoE networked switch.

4. The Division 8 Contractor is responsible for providing the following:

   a. Final terminations of all internal wiring of electrified door hardware and door power supply connections.
   b. Final terminations from the door power supply or relay board up the power transfer hinge or similar connection point of the electrified door hardware.

M. Access Control System Power Supplies

1. Unless otherwise noted, all power supplies shall be hardwired to the 120VAC circuit. No pigtails / plugs shall be acceptable.
2. Enclosed Wall Mounted Access Control Panel Power Supply

   a. The Security Contractor shall provide and install devices as indicated in the drawings.

b. Security Contractor shall refer to Division 8 Finish Hardware schedules and system requirements for sizing and quantity of boards in the enclosed power supply.
c. The Security contractor shall provide dual voltage power supply board as specified.
d. The Security Contractor shall provide and install Power Control Modules as specified.
    1) Each Lock power output cable shall be terminated to a dedicated port on the Power Distribution Module specified.

e. The Security Contractor shall provide and install Power Distribution Modules as specified.
    1) Each request-to-exit motion (where required) cable shall be terminated on a dedicated port on the Power Distribution Module.

f. The Security Contractor shall size each enclosure(s) with dual voltage power supplies as specified to include an additional total amperage of at least 20% additional maximum amperage output per enclosure for future expansion as required.
g. The Security contractor shall provide (2) back up batteries as specified per each enclosure.
h. 115VAC hardwired power shall be provided and installed by Division 26 Electrical Contractor.
i. 30Amp dedicated circuit shall be provided and installed by the Division 26 Electrical Contractor.
j. Provide U.L. Listed power supplies for all Access Control System panels as specified.
k. Provide battery chargers and batteries for all power.
l. Monitor low battery and power fail alarms for each power supply.
m. Tampers shall be wired as recommended by the manufacturer.

3. Backup Battery(s)

a. The Security Contractor shall provide and install (2) batteries per power supply enclosure.
b. The Security Contractor shall label the installation date for each battery with printed labels.

N. Access Control Cabling

1. Pathways

a. Wires shall be routed utilizing the pathways as indicated in the technology drawings. Reference Division 27 specifications for additional requirements.
b. Access control cabling shall be routed separately from the network data communication cables specified in Division 27. Contractor shall provide separate pathways and j-hooks for the cables specified herein.

2. Wiring Techniques

a. All cables shall be pre-tested for shorts prior to final device terminations after cables are installed.
b. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored in the provided enclosure(s) as detailed in the drawings. If an enclosure is not provided for the specified devices herein, the service loop shall be installed on a j-hook in the nearest accessible ceiling space closest to the device.
c. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored at the access control panel.
d. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored on the wall above the ladder rack in the regional MDF / IDF / Mechanical room(s).
e. Install code compliant fireproofing techniques for all penetrations of fire rated partitions and slabs, where the penetrations are made by or used for installation of the ACS.

f. All wire and cable shall be continuous from device location to the final point of termination (“Home Run”). No mid-run cable splices shall be allowed.
g. Wire and cable within control panels, power distribution cabinets and other security enclosures shall be neatly installed, completely terminated, pulled tight with slack removed and routed in such a way as to allow direct, unimpeded access to the equipment within the enclosure. All wire and cable shall be bundled and tied. Velcro cable ties shall be utilized.
h. Neatly bundle and wrap all horizontal / vertical runs (above accessible ceilings and not within conduit) wire and cable at intervals as code requires. Provide support as required. All supports shall be UL listed for the application.
i. All system wiring within vertical riser shafts (as required) shall be bundled, wrapped, and tied to the structure at one-meter intervals in order to isolate it from other wire and cable within the shaft. Additionally, all wire and cable within the shaft shall be supported at least every two floors using manufacturer approved vertical management hardware and installation methods. Provide all personnel and equipment necessary to install and support the cable. All equipment shall be UL listed for the application.
j. Provide grommets and strain relief material where necessary to avoid abrasion of wire and excess tension on wire and cable.

3. Splices / Transitions

a. Home run cabling is the preferred method of installation for all Access Control System devices and panels.
b. In the unlikely event that a splice or transition is required, the Contractor shall identify all splices / transition points required for the completion of the project and confirm, in writing, in advance, via RFI with the Architect / Design Consultant for acceptance of the proposed wiring techniques to be utilized.
c. By not submitting an RFI, Contractor acknowledges that no major splicing is required for the completion of this project. Any splices not previously identified that are found to be faulty shall require the Contractor to re-install the affected cable in its entirety at no cost to the Owner.
d. Contractor shall clearly mark splices / transition points on the shop drawings and As-Built drawings as part of the project close-out.

4. Cable Dressing

a. No excessive cable slack shall be left in enclosures.
b. Cables shall be dressed in a professional manor.
c. Cables shall be routed in 90-degree angles to termination points inside enclosures.
d. Ty raps / zip ties are not permitted, hook and loop / Velcro is acceptable.
e. Exposed wires are not acceptable.
f. Enclosures and equipment / Telecommunication room shall be left clean without debris including but not limited to: labels, connectors, screws, etc.
g. All spare / unused cables shall be in the enclosure shall be neatly coiled and protected to avoid any shorts to ground.

O. Device Labeling

1. Unless otherwise, all installed devices shall be labeled. Contractor shall verify device numbering scheme and Owner’s current naming convention standard in writing in advance via RFI prior to generating any labels.
2. All labels shall be machine printed and adhered to the device in a location that is visible and legible to the naked eye.
3. All labeling in the field shall match the same labeling scheme in the closeout documents.
4. Refer to Div. 27 specifications for data network device cabling requirements.
5. Cables overall sheath shall be labeled within (6) inches from the point the cable enters/exits the enclosure inside the Equipment Room / Telecommunications / Security Control Location Rooms.
6. Cables shall be labeled within (1) inch from the termination point inside the Equipment Room / Telecommunications / Security Control Location Rooms.
7. Cables shall be labeled within (1) inch from the termination point at the device end.

8. Cables shall be labeled identically at both ends.

P. Fire Stop / Smoke / Sound Sealants

1. Use proper sealant as recommended by the manufacturer for the specific application in compliance with per all applicable codes: City, State, Federal, LAHJ.
2. All existing pathways shall be resealed in compliance with per all applicable codes: City, State, Federal, LAHJ.

Q. Grounding and Bonding

1. All grounding and bonding shall be performed by a licensed electrical contractor to ensure the electrical integrity of the low voltage system and devices specified herein per federal / state / local codes and standards.
2. Contractor shall notify the Architect / Owner / Design Consultant via written RFI of any site conditions or installations that will require additional coordination.
3. Contractor shall ensure proper grounding of shielded or non-shielded cabling and devices conform to the specified devices manufacturer's installation guidelines.
4. The Division 28 Contractor is responsible for coordinating with the Division 26 Contractor for grounding and bonding security devices per applicable codes and standards.

R. Conduit, Boxes and Raceways (For Reference Only - By Division 26)

1. Install all conduit necessary for a complete installation, but not provided for in the Security Drawings, in finished areas concealed in chases, furring's, concrete slabs and/or above suspended ceilings. No exposed conduit shall be installed within public areas.
2. Conduit shall be carefully installed, properly and adequately supported as required to comply with the requirements outlined herein and as required by the NEC to provide a neat, industry-standard installation. Horizontal conduit runs shall be supported by clamps, pipe straps, special brackets, or heavy iron tie, tied to the black iron structural members supporting the ceiling. Fastening of conduit to masonry walls, floor or partitions require malleable pipe clips with screws and suitable expansion sleeves.
3. All conduits shall be cut accurately to measurements established at the building and shall be installed without springing or forcing.
4. All required inserts shall be drilled-in and all openings required through concrete or masonry shall be saw cut or core drilled with tools specifically designed for this purpose.
5. Swab out and remove all burrs from conduit before any wires are pulled.
6. Lay out and install conduit runs as to avoid proximity to hot pipes. In no case shall a conduit be run within 75 mm of such pipes, except where crossings are unavoidable and then the conduit shall be kept at least 25 mm from the covering of the pipe crossed.
7. Provide fire stops where conduits penetrate fire rated walls and/or floors.
8. All conduit installation, whether run exposed or concealed, shall be approved prior to installation by the Architect.

S. Access Control System Programming And Data Entry

1. Provide all initial system programming and setup of the ACS including, but not limited to the following:

    a. The Contractor will be provided access to the OFOI server for "general" programming. The Contractor shall provide for the following "general" programming of the access control system. Fort Bend ISD will then complete the detailed programming.
        1) Naming of all doors
        2) General access level at all doors
        3) General access level is all doors are locked 24/7/365.

T. High Voltage (120VAC) Power Requirements (For Reference Only – by Division 26)

1. 120VAC AC power dedicated to security shall be provided by the electrical contractor for the Access control system as indicated on drawings. Coordinate with the Architect to establish locations of security dedicated 120VAC AC circuits.
2. Connect to the AC power (provided by electrical contractor) and provide UL listed power supplies and transformers to distribute low voltage power to the system components as required.
3. Provide all conduit and wiring from the AC power facilities to the Access Control / Power Supply Enclosures.
4. Provide Mechanical separation to isolate 120VAC wires from other low voltage cabling. Low voltage cabling shall not route over/under/parallel to 120VAC wires.

U. Surge Protection / Lightning Arrestors

1. Protect all exterior devices, control, power, signal cables and conductors that are power surges. Each surge protector shall be UL Listed.
2. Unless otherwise noted, surge protection devices shall be installed at both the edge and head end of the cabling run.
3. Surge devices shall be installed as close as possible to the equipment they are protecting.
4. Surge Protection shall be properly installed in an accessible ceiling or enclosure space to allow for cable removal during troubleshooting.
5. Include surge protection device locations on as-builts and shop drawings.
6. Provide protection against spikes, surges, noise, and other line problems for all system equipment and components.
7. Properly ground surge protection devices per the manufacturer installation requirements.

3.5 TESTING REQUIREMENTS

A. As a prerequisite, the Contractor shall perform a burn-in of the system that is in accordance with the manufacturer’s installation guidelines.

1. All devices shall be powered up and tested in a phased approach in a controlled testing environment on or off premise (to be coordinated with the Owner).
2. Update firmware with most up to date version (to be coordinated with the Owner).

B. Each system hardware device shall remain operational during the burn-in test for a minimum of eight (8) hours without failure.

1. Contractor shall provide successful burn-in results in writing to the Architect / Design Consultant prior to final acceptance.

C. Security Contractor shall conduct a complete QA/QC test of the entire system and provide a written report of the test results (Punchlist). The tests shall include, but not limited to:

1. Hardware
2. Software
3. Network Connectivity
4. Device Power
5. Configure system device settings.

D. Identify and remediate any issues and/or system faults.

E. It is the responsibility of the Contractor to verify that all devices, equipment, software, interfaces, sub-system interfaces and integrations are fully functional and operational.

F. Contractor shall rectify all issues discovered during the QA/QC process and shall document these corrections via a Contractor provided punch-list.

1. At a minimum, the punch-list shall contain:

a. Date of the item identified.

b. Description of the discrepancy with photographs, as necessary.
c. Date the item was rectified.

G. All QA/QC items shall be corrected, and an electronic report surrendered to the Architect / Design Consultant prior to calling for Substantial Completion.

3.6 TRAINING REQUIREMENTS

A. Provide (4) hours of training for two (2) persons on each system.

B. Provide a test report showing the system has been 100% tested and 100% operational prior to training / demonstration.

C. Coordinate with the Owner to establish a training outline and schedule. Submit a comprehensive training curriculum to the Owner once all preliminary coordination is complete. The Owner will revise and comment on the curriculum as required.

D. Contractor training shall be conducted onsite/virtually with a manufacturer's representative in attendance.

E. Operator training shall include, but not be limited to the following:

1. All operating procedures and graphic user interface (GUI)
2. System configuration
3. Alarm acknowledgement, alarm response logging, and map graphics functionality.
4. Image capture, badge printing, and print ribbon replacement.

F. Administrative training shall include, but not be limited to the following:

1. All operating system procedures, configuration variables and graphic user interface (GUI)
2. Database functions and setup
3. Cardholder input and deletion procedures
4. Report generation
5. Card format configuration
6. Badge creation and design

G. Record, label, and catalog all training on DVD and "user's manual" written specifically for the Owner personnel onsite, for daily routine operations of the systems. Provide the DVD and user's manual to the Owner for future in-house training sessions and / or reviews. Furnish all temporary equipment necessary for recording all training sessions. Maintain accurate and up-to-date time sheets of all training sessions.

H. The Owner reserves the right to use any excess training hours, not used by the time of system completion, for future training as requested until the total number of training hours has been completed.

3.7 FIELD OBSERVATIONS

A. A minimum of ten business days in advance, Contractor shall notify the Design Consultant and Owner as to the readiness for a Field Observation for the following at a minimum but not limited to:

1. Rough-In Observation – after conduits have been installed, but before walls have been installed.
2. Above Ceiling Observation – after cabling has been installed, but before ceilings have been installed.
3. Final Site Observation – a minimum of two weeks before Substantial Completion.

B. During Design Consultant's Final Site Observation of the installed systems, provide a minimum of one factory-trained/certified technician on the operation of all installed systems for up to (1) 8-hour day to assist with Design Consultant's functional testing.

C. Non-Conforming Work (Punch-List)

1. After receipt of written notice of deficiencies (Punch-List), Contractor shall correct all defective work within ten business days. If the work has been identified to be corrected by the Architect/Design Consultant, the Contractor shall remediate it in conformance with the contract documents at no cost to the Owner.

3.8 SUBSTANTIAL COMPLETION

A. It is the responsibility of the Contractor to ensure that all punch list items are 100% complete. The Contractor shall complete an internal Quality Assurance / Quality Control inspection, make all corrections, document the deficiencies and corrections prior to requesting any further inspections with the Architect / Owner / Design Consultant.

B. Prior to any Substantial Completion, the Contractor shall submit a minimum of two sets of preliminary (first draft) Record Drawings (As-Builts) to the Architect/Design Consultant. The preliminary Record Drawings are to be used by the Architect/Design Consultant to conduct the system substantial completion inspection.

C. The Contractor shall notify the General Contractor / Architect / Design Consultant that all the items noted above have been completed and the installation is ready for inspection.

D. The Architect / Design Consultant shall schedule an inspection of the installation with the General Contractor and the Installing Contractor(s) present.

E. The Substantial Completion Inspection shall consist of the following:

1. The Project Manager/Superintendent and Installation Technician shall be on site with all tools, materials, and equipment ready to resolve any minor issues identified.
2. The Design Consultant or designated representative shall visually inspect the installation in accordance with the official design documents.

a. The Contractor shall be prepared to remove and reinstall (minimum 10%) randomly selected security devices to inspect the mounting, cabling, terminations, connectors, labeling, tampers.

3. Punch list items shall be identified and documented in a provided punch list with a date and description of the issue found, and a date the discrepancy was addressed and the resolution.

F. Provide all personnel, equipment, and supplies necessary to perform all site testing. All video surveillance cameras shall be pointed and aimed at the views as shown in the drawings and using best practices. Contractor shall provide a minimum two employees to verify all cameras have been pointed and aimed to achieve Owner final approval. A manufacturer's representative may be present on site to answer any questions that may be beyond the technical capability of the Contractor's employees, if the Contractor so elects or by specific request of the Architect or Owner, at no charge to the Architect or Owner.

G. The Contractor shall coordinate with the Architect/Design Consultant on security related construction clean-up and patch work requirements. Security equipment closets and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, remove all waste materials, rubbish, the Contractor's and its subcontractors' tools, construction equipment, machinery, and all surplus materials.

H. At their discretion, if the Design Consultant or their designated representative deems the site not ready for inspection/observation, the inspection will be cancelled. The Contractor(s) shall

immediately address all issues identified and shall reschedule the inspection in a timely manner so as not to affect the overall construction schedule.

I. Adjustments and Documentation: energizing and testing the systems, make adjustments and document the setting of controls, configurations, as applicable. Tabulate all data along with an inventory of test equipment, a description of testing conditions and a list of test personnel.

J. Test Documentation: Create and provide complete test reports documenting the results of each performed on each device, control panel, power supply, and other elements of the system. Copies of preliminary test data shall accompany copies of performance testing data as part of the Operating and Maintenance submittal.

3.9 PROJECT CLOSEOUT DOCUMENTATION

A. As-Built Drawings

1. Drawings shall be provided to the Architect / Owner / Design Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Architect / Owner / Design Consultant.
2. Unless otherwise requested, Contractor shall provide digital copies of close-out documents and deliver to the Architect / Owner / Design Consultant electronically.
3. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
4. Drawings shall be provided in the original size as issued by the Architect / Design Consultant.
5. Drawings shall retain the formatting and title block of the original drawings as issued by the Architect / Design Consultant.
6. Provide a conformed set of Drawings as related to the project, depicting the condition of the access control system as installed to include but not limited to:

    a. ASI, PR, and Addendum items installed throughout the duration of the project.

7. Provide a hard copy of the conformed set of drawings to be physically stored at the end of the project in a designated Access Control System enclosure. Coordinate with Owner for final storage location.
8. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of the following not limited to:

    a. Access Control System Riser / Signal Flow Diagrams
    b. Access Control System Backboard Layouts
        1) To include access control boards, power supplies, pathways, etc.

    c. Sleeves, Backbone Cabling and Communication pathways
    d. Access Control System device locations and labeling scheme.

B. Operation & Maintenance Manuals

1. Unless otherwise noted, provide O&M manuals electronically to Owner to include all drawings, product datasheets, hardware manuals as related to the project.
2. Coordinate with the Owner for provisioning of physical storage devices (Hardcopy, Flash Drive, CD/DVDs)

C. Manufacturer’s Product Warranty

1. Certificate of product warranty shall be provided to the Architect / Owner / Design Consultant at the time of final system acceptance. Final payment will not be recommended until this certificate of product warranty is received and approved by the Architect / Design Consultant.
2. The manufacturer of the solution shall furnish a product warranty as per the specifications starting at final system acceptance.

3. One original and two copies of the Manufacturer's product warranty shall be provided.

D. Contactor's Statement of Warranty

1. Statement of warranty shall be provided to the Architect / Design Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Architect / Design Consultant.
2. Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor and workmanship starting at final system acceptance.
3. One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e., Contractor name, Point of Contact, address, phone number and email address) and start and end date for warranty call outs.

END OF SECTION 281300

SECTION 28 16 00 - INTRUSION DETECTION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This section identifies the requirements, technical design, and specifications for the intrusion detection system at the Fort Bend ISD Willowridge HS Fine Arts Addition and Renovation, located in Houston, Texas (“Owner”). The intrusion detection system as specified is an industry-standard and it shall be an extension of the District’s existing system which includes keypads, motion detectors, door contacts, control panels, power supplies and intrusion detection cabling as specified.

B. It is the Contractor’s responsibility to review this specification and associated project specifications and drawings in their entirety, prior to bidding on the project. By bidding on this project, the contractor acknowledges that they have read and fully understand these specifications, with no exceptions. Contractor shall review the drawings, specifications, and existing conditions prior to bidding on the project. Any discrepancies shall be brought to the attention of the Architect / Design Consultant via request for information (RFI) in writing for evaluation and or clarification. If these items are not brought to the attention of the Architect / Design Consultant the more costly or difficult manner, and the better quality or greater quantity of work shall be provided by the contractor in accordance with the Architect's / Design Consultant’s interpretation at no additional cost to the owner.

C. Contractor shall furnish and install all materials, equipment, and labor necessary to provide a complete and functional turn-key intrusion detection system regardless of any items not listed or described in this specification or associated drawings.

1.2 RELATED SECTIONS

A. Section 26 00 00 – Electrical

B. Section 26 09 00 – Lighting Controls

C. Section 27 10 00 – Structured Cabling System

D. Section 28 13 00 – Access Control System

1.3 REQUIREMENTS INDEX

A. Contractor Experience Requirements

B. Submittal Requirements

C. Products – General Requirements

D. Acceptable Manufacturers

E. Codes, Standards and Regulations

F. General Requirements

G. Coordination Requirements

H. System Requirements

I. Testing Requirements

J. Training Requirements

K. Project Closeout Documentation

1.4 CONTRACTOR EXPERIENCE REQUIREMENTS

A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 1 apply to the work specified in Division 28 and shall be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.

B. Contractor Experience Requirements

1. The Contractor shall be a certified Honeywell Vista Preferred Partner prior to submitting a bid for the work.

2. The Contractor shall possess all relevant Manufacturer Certifications (i.e., intrusion detection systems, hardware installation, software installation and programming) for both the company and individual technicians prior to submitting a bid for the work.
3. The Contractor shall have a manufacturer certified technician onsite throughout the duration of the installation phase of the project.
4. The Contractor's Project Manager shall be dedicated to this project for the duration of the project and shall be available for all onsite coordination meetings.
5. The Contractor shall have been in business for a minimum of five (5) years.
6. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a 75-mile radius of the project site.
7. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.
8. Licensed in the State of Texas.
9. Contractor is responsible for procuring all applicable intrusion detection permits required for this project with Fort Bend County / Fire Marshall.

C. Submitting Contractor must be certified to install products and services for systems they are proposing. No subcontract of services will be allowed for any security scope of work. Contractor must submit to the Owner prior to starting any work the factory training certifications for all personnel that will be working on the system.

1.5 SUBMITTAL REQUIREMENTS

A. Bid / Proposal Submittal

1. Contractor shall provide as part of their bid/proposal:
   a. Breakdown of proposed parts and labor required for the completion of the project.
   b. Proposed construction schedule in a Gant chart format
   c. Detailed Safety Plan
   d. Detailed documentation of QA / QC
   e. A detailed description of the installation team(s) that would perform the work.
   f. A resume for each of the key project personal.

B. Pre-Installation Submittal

1. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Architect / Design Consultant.
2. The Contractor is responsible for notifying and obtaining written approval via RFI from the Architect / Design Consultant / Owner of any proprietary devices, software, and/or installation processes.
3. Contractor is responsible for obtaining permitting as required in accordance with the authority having jurisdiction (AHJ), local, city, state, federal, and/or applicable law requirements.
4. Contractor shall ensure submittals are submitted in 10 business days to ensure all products can be ordered and received on site in order to not cause any delays. Any products having long lead times (more than 60 days) that may negatively impact the schedule shall be clearly identified in writing so the review and approval can be expedited.
5. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e., product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product certifications for installers, etc.). Submittals not in the proper sequence will not be approved.
6. Contractor shall provide the following as part of their submittal:
   a. Manufacturer product data sheets for each proposed system component.

1) For product data sheets containing more than one (1) part number or product, the Contractor shall clearly identify the specific part number or product being submitted. Product data sheets without the part number clearly identified will not be approved.

2) Contractor shall identify any products that are discontinued, end of life, or near end of life, and shall propose equal alternate to the discontinued product in writing.

b. Manufacturer Product Certifications for Company.

c. Manufacturer Product Certifications for Installers.

d. Manufacturer Warranty letters.

e. Documentation indicating that Contractor has been in business for (5) years.

f. Address of Contractor's local office within a 75-mile radius of the project site.

g. Quantity of full-time, local technicians within a 75-mile radius of the project site.

h. List of five (5) contractor-installed projects of a similar size and scope that have been in operation for at least (1) year. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, Brief Description of Project, Client Point of Contact Name and Phone Number.

i. List of completed and ongoing projects with the Owner. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, and Brief Description of Project.

j. List of subcontractors performing any work on the project. List shall clearly identify the subcontractor's legal name and address, the scope of work to be performed by the subcontractors and the overall percentage of the project being provided by the subcontractor. If there are no subcontractors performing any work on the project, submit a statement on company letterhead clearly indicating no subcontractors will be performing any work on this project.

k. Manufacturer's certification letter confirming that the proposed intrusion detection system components do not have any known cybersecurity notices, bulletins, or alerts. If a vulnerability is discovered, the contractor shall notify the Architect / Design Consultant within 24 business hours. Provide the make and model of the associated equipment and the vulnerability.

l. Manufacturer cybersecurity hardening guide. If one is not available, provide documentation from the manufacturer stating such.

m. A complete set of shop drawings to include at minimum but are not limited to:

1) Device locations

2) Cable Type and Pathways

3) Panel Termination Schedule

4) Elevation Drawings to illustrate the associated devices and the heights at which they will be installed.

5) Naming Convention Information

6) Signal Flow Diagram including full topology.

n. Supplemental documents to include but not limited to:

1) Safety Plan

2) Contractor QA/QC Document

3) Construction Schedule in a Gant chart format

4) Contractor Cybersecurity Hardening Guide

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The following sections specifically list the acceptable equipment types and items for this project.

B. Unless otherwise stated, all software and licensing shall be for the most current, up to date version of the system provided. For existing systems, Contractor shall obtain written verification of the Owner's most current software version and notify via RFI the Architect / Design Consultant / Owner if implementation of the most current software / license version will require an upgrade to the Owner's existing system.

C. Architect / Design Consultant will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.

D. Proposed equivalent items must be approved in writing by the Architect / Design Consultant prior to purchase or installation. Proposed equivalent items must meet or exceed these specifications and the specifications of the specified item.

E. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall submit a formal RFI for an appropriate substitute.

F. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished at no additional cost to the owner.

G. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.

H. Labels on all cabling, materials, and equipment must indicate a nationally recognized testing laboratory.

I. Original Equipment Manufacturer (OEM) documentation must be provided to the Architect / Design Consultant which certifies performance characteristics and compliance with ANSI/TIA/EIA 568-C standards where applicable.

J. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any concerns with lead times in writing to the Architect / Design Consultant. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues, and the Contractor will have all products on-site when needed to complete the job as per the project schedule.

K. Quantities listed are for reference only, contractor is responsible for furnishing materials as required to provide a fully functional system. Where quantities are not noted, they may be obtained from the drawings.

L. All software, hardware, and equipment (from the date of RFP) shall be tested, currently available and commercially off the shelf product. (COTS).

M. Written approval must be obtained from the Owner / Architect / Design Consultant for any proprietary or custom software and/or equipment prior to the beginning of the project.

2.2 ACCEPTABLE MANUFACTURERS

A. Control Panels

1. Honeywell/Ademco, VISTA-250BPT - (Primary Communication via Network)

B. Modules

1. Intrusion Communicator (ABS), Cellular (Back-up) – Owner Furnished / Contractor Installed
    a. StarLink SLE-LTEV
2. Honeywell/Ademco Eight-Zone Input Expander
    a. VISTA 4208U
3. Intelligent Relay Board – Lighting Controls
    a. Ademco 4204
4. V-Plex Single Output Relay Module
    a. Ademco 4101SN

C. Enclosures

1. Honeywell/Ademco (Sized as Required)
    a. Tamper Switch

b. Lock and Key

D. Power Supplies/Charger/Battery Backup
   1. Enclosed Altronix AL Series
   2. Or approved equal

E. Power Distribution Module Board
   1. Enclosed Altronix PD8
   2. Enclosed Altronix PD4
   3. Or approved equal

F. Battery
   1. Yuasa np7-12
   2. Or approved equal

G. Keypads
   1. Honeywell/Ademco Alpha Keypad, Vista 6160

H. Motion Detectors
   1. Bosch Panoramic 360 Ceiling 60’ Motion Doctor Detector, Part Number DS938Z
   2. Bosch Panoramic 360 Ceiling 25’ Motion Detector, Part Number DS936
   3. Bosch TriTech 60x60 PIR Microwave Motion Detector, Part Number DS860
   4. Bosch TriTech Long Range PIR Detector Part Number DS720

I. Motion Detector Cage - (All devices in gyms)
   1. 7 in H x 5.75 in W x 4.5 in D – Part Number STI-9621
   2. 12 in H x 12 in W x 8 in D – Part Number STI-9731
   3. Or approved equal

J. Door Contacts
   1. Recessed SPST
      a. GRI 180-12
      b. GRI 195-12 (DPDT)
      c. Or approved equal
   2. Surface Mount with armored cable
      a. GRI- 4402-A
      b. GRI 4405-A (DPDT)
      c. Or approved equal
   3. Overhead Door Position Switch
      a. Amseco ODC-59A

K. Duress Button
   1. USP HUB2SA - Momentary

L. Siren
   1. Self-Contained Dual Tone Surface Mount Siren
      a. SS-2

M. Intrusion Detection Wiring

1. Lake Cable, Color Orange and Plenum Rated (Cable shall be sized based on length)
   a. Keypad – 18 AWG / 4-Conductor
      1) Lake Cable Part #: P184C
      2) Or approved equal
   b. Motion Detectors - 18 AWG / 4-Conductor
      1) Lake Cable Part #: P184C
      2) Or approved equal
   c. Door Contract – 22 AWG / 2-Conductor
      1) Lake Cable Part # P222C
      2) Or approved equal
   d. Duress Button - 18 AWG / 4-Conductor
      1) Lake Cable Part #: P184C
      2) Or approved equal
   e. Siren – 18 AWG / 2-Conductor
      1) Lake Cable Part #: P182C
      2) Or approved equal
   f. Intelligent Relay Board (Lighting Controls) – 18 AWG / 6-Conductor (Coordinate FBISD cable color for Lighting Controls)
      1) Lake Cable Part #: P186C
      2) Or approved equal
   g. Communication Cable
      1) Lake Cable Part #: P184C
      2) Or approved equal

N. Pathway Cable Support

1. Panduit J-Mod Cable Support System
2. Erico – CADDY CAT LINKS J-Hook Series
3. Panduit Plenum Rated Hook & Loop (Plenum Rated, Black)

O. Labeling

1. Permanent Labels for Copper Cables
   a. Panduit Self-Laminating Labels

P. Fire Stop

1. STI Spec Seal
2. 3M Products

PART 3 - EXECUTION

3.1 CODES, STANDARDS, REGULATIONS

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

1. ASTM B 1 (2001; R 2007) Standard Specification for Hard-Drawn Copper Wire

2. ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
3. ASTM D 1557 (2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
4. ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

C. Alliance for Telecommunications Industry Solutions (ATIS)

D. Building Industry Consulting Service International (BICSI)

1. Telecommunications Distribution Methods Manual 13th Edition
2. Outside Plant Design Reference Manual 5th Edition
3. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
4. NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling
5. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

E. Federal Communications Commission (FCC)

1. FCC Part 15, Radiated Emissions Limits, revised 1998
2. FCC Part 68, Connection of Terminal Equipment to the Telephone Network, revised 1998
3. FCC Part 76, Cable Television Service, revised 1998

F. Insulated Cable Design Consultants Association (ICEA)

1. ICEA S-87-640 (2006) Fiber Optic Outside Plant Communications Cable
2. ICEA S-98-688 (2006) Broadband Twisted Pair, Telecommunications Cable Aircore, Polyolefin Insulated Copper Conductors
3. ICEA S-99-689 (2006) Broadband Twisted Pair Telecommunications Cable Filled, Polyolefin Insulated Copper Conductors

G. International Electrotechnical Commission (IEC)

H. Institute of Electrical and Electronics Design Consultants, Inc. (IEEE)

1. IEEE Standard 81-1983, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System
2. IEEE Standard 1100-1999, Recommended for practice for Powering and Grounding Sensitive
3. Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)
4. IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code
5. IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms

I. International Organization for Standardization (ISO)

1. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)
2. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
3. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999
4. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
5. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999

J. National Cable Television Association (NCTA)

K. National Electrical Manufacturers Association (NEMA)
   1. NEMA C62.61 (1993) Gas Tube Surge Arresters on Wire Line Telephone Circuits
L. National Fire Protection Association (NFPA)
   1. NFPA-70, National Electrical Code
   2. NFPA-75, Protection of Electronic Computer Data Processing Equipment.
   3. NFPA-101, Life Safety Code
   4. NFPA-297, Guide on Principles and Practices for Telecommunications Systems
   5. NFPA-780, Standard for the Installation of Lightning Protection Systems.
M. National Institute Standards and Technology (NIST)
N. Occupational Safety and Health Administration (OSHA)
O. Security Industry Association (SIA)
P. Telecommunications Industry Association (TIA)
   1. ANSI/TIA-568.0-D-1, Generic Telecommunications Cabling for Customer Premises.
   2. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard.
   3. ANSI/TIA-568.0-D-1, Balanced Twisted-Pair Telecommunications Cabling and Components Standard.
   4. ANSI/TIA-568.3-D-1 Optical Fiber Cabling Components Standard.
   5. ANSI/TIA–569-D-2, Commercial Building Standard for Telecommunications Pathways and Spaces.
   6. ANSI/TIA-606-C, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
   7. ANSI/TIA-607-D, Commercial Building Grounding and Bonding Requirements for Telecommunications
   8. ANSI/TIA-758-C, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.
Q. U.S. Department of Agriculture (USDA)
   1. RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment and Construction
   2. RUS Bull 1751F-643 (2002) Underground Plant Design
   3. RUS Bull 1751F-815 (1979) Electrical Protection of Outside Plant
   4. RUS Bull 1753F-201 (1997) Acceptance Tests of Telecommunications Plant (PC-4)
   5. RUS Bull 1753F-401 (1995) Splicing Copper and Fiber Optic Cables (PC-2)
   6. RUS Bull 345-65 (1985) Shield Bonding Connectors (PE-65)
   7. RUS Bull 345-72 (1985) Filled Splice Closures (PE-74)
   8. RUS Bull 345-83 (1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)
R. Underwriters Laboratories, Inc. (UL)
   1. UL 294 Standard for Access Control System Units
   2. UL 294B Standard for Power Over Ethernet (PoE) Power Sources for Access Control Systems and Equipment
   3. UL 109 Standard Method for Flame Tests of Flame-Resistant Fabrics and Films
   4. UL 1076 Standard for Proprietary Burglar Alarm Units and Systems

3.2 GENERAL REQUIREMENTS

A. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), State of Texas, the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the aforementioned laws, ordinances, and rules, the matter shall be referred to the Architect / Design Consultant for direction before proceeding with that part of the work.

B. Contractor shall meet the specifications and standards from the latest NFPA and NEC publications. In the event of any conflicts between Standards and Codes the more stringent shall take precedence.

C. The Contractor shall install the materials in accordance with these specifications and the manufacturer's installation guidelines. Equipment and materials installed by the Contractor shall be free of defects and damage.

D. No deviations from the plans, details or specifications shall be made without full consent in writing of the Architect / Design Consultant. The Contractor shall have written approval from the Architect / Design Consultant for any additional work beyond the Contract Documents prior to beginning such work.

E. In the event site conditions do not allow the contractor to follow the execution requirements specified herein or in the provided details, the Contractor shall submit via RFI an alternative means and methods that is approved in writing by the Architect / Design Consultant.

F. The Contractor shall obtain written permission from the Architect / Design Consultant before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to: girders, beams, floors, walls, roofs, and/or ceilings.

G. If the Contractor does not obtain written approval from the Architect / Design Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.

H. Contractor shall notify the Architect / Design Consultant a minimum of (2) weeks prior to beginning work and will participate in a pre-construction meeting with the Architect / Design Consultant to perform a walkthrough, review the scope of work, schedule, and escalation procedures.

I. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap cable, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.

J. Contractor shall be responsible for the repair of any damage caused by the contractor during the installation.

K. Contractor shall test all cables prior to and post installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.

L. Contractor shall maintain a set of working specifications, design drawings, and record drawings to be kept on site at all times and shall update the record drawings with any changes on a weekly basis. Record drawings shall be made available for inspection at the request of the Architect / Design Consultant.

M. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.

N. Equipment and materials shall be delivered and stored in accordance with the manufacturer's guidelines at the Contractor's expense.

O. Contractor shall make all stored equipment and materials available for inspection at the request of the Architect / Design Consultant.

P. All equipment and material used in the installation shall be approved by the manufacturer for the environment in which it is being installed.

Q. Devices installed in public spaces shall be mounted and secured using tamper-proof security fasteners unless otherwise noted.

R. Cables shall be properly supported in accordance with industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.

S. Contractor shall be responsible to properly protect information outlets from damage by other trades during construction.

T. Cables shall be routed at 90-degree angles to the building structure. At no time shall a diagonal pull be installed.

U. The Contractor shall not install cables in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be removed and replaced at no cost to the Owner.

V. The manufacturer and contractor shall take positive measures to prevent the introduction of cybersecurity threats to the Owners technology infrastructure. These measures shall include but are not limited to:

1. The contractor shall scan contractor owned equipment for cyber threats such as viruses, malware, ransomware, etc., prior to connecting the contractor owned devices to the Owners network.
2. Ensure all technicians installing or configuring equipment are trained on the prevention of introduction of cyber threats to electronics, i.e., servers, and other associated equipment.
3. All project documents shall be properly securely stored behind encryption and password protection to avoid unauthorized distribution of documents.

W. Labeled Doors and Frames

1. In no instance shall any UL labeled door or frame be drilled, cut, penetrated, or modified in any way.
2. The Contractor shall be responsible for replacing any labeled door or frame that is modified without written approval from the Architect.

3.3 COORDINATION REQUIREMENTS

A. The Contractor is responsible for the coordination of the following items and their respective disciplines included but not limited to.

B. Coordinate with the Architect to ensure that:

1. Adequate conduit is provided and that equipment backboxes are adequate for system installation.
2. Adequate power has been provided and properly located for the security system equipment.
3. Doors and door frames are properly prepared for electric locking hardware and door position switches.
4. Access hatch locations (when required) shall be submitted in writing via RFI and coordinated with the Architect.
5. Finishes and colors of all equipment visibly installed in public areas. Submit all finish and graphics for all equipment to the Architect for approval prior to installation.

C. Coordinate with the Division 8 contractor for the following:

1. Door hardware manufacturer installation, power, and ADA requirements.

D. Contractor is responsible for coordinating with gate controller installers for controller locations and interfacing terminations.

E. Coordinate with the Division 26 contractor for the following:

1. High voltage power pathways, grounding, and bonding requirements.
2. Drive up pedestal pathways to the interior of the building.
3. Pathways, rough ins, back boxes, and conduit sizes for all intrusion detection peripheral devices.

F. Coordinate with the Division 27 contractor for the following:

1. Installation and power requirements of network infrastructure associated to the specified Intrusion detection System
2. Associated patch cable lengths and quantities required for the specified Intrusion detection System
3. Location, power, and backup requirements for rack mount equipment.

G. Coordinate with the Division 28 (Fire) contractor for the following:

1. Requirements associated with fire alarm system(s).

H. The Contractor is responsible for coordinating intrusion detection locations and mounting preferences of all specified security devices with the Architect / Design Consultant prior to installation.

I. The Contractor is responsible for coordinating all intrusion detection programming requirements with the Owner / Architect / Design Consultant.

J. The Contractor shall coordinate with the Owner for the following:

1. Naming Conventions of devices, controllers, doors, etc.

K. The Contractor is responsible for coordinating with the Lighting Controls Contractor for Arm, Disarm, and alarm controls.

3.4 SYSTEM REQUIREMENTS

A. Provide equipment as indicated on the drawings and specified herein. Additional specific installation requirements are as follows:

1. The Intrusion detection System control panels, zone expanders, motion sensors, door contacts, intrusion detection cabling, and all other peripheral components as indicated on the drawing and specified herein.

2. Any devices associated with the installation shall have the latest firmware updates downloads via owner approved secure link from the system software and/or remotely from the manufacturer.

3. All Intrusion detection software, equipment and system requirements shall be installed per their respective Manufacturer Installation Guidelines.

B. Control Panel

1. The Control panel shall be the main point of programming, monitoring, accessing, securing, and troubleshooting the IDS.

2. The Control Panel shall be wall mounted in the “SR” room(s).

3. The Control Panel shall provide a means contact FBISD Dispatch via a Cellular communicator interface.

4. The Control panel shall utilize a Multifunctional Keypad, Input and Output Modules for expansion of alarm zones, interfacing with additional security subsystems, programming, monitoring, and controlling the IDS.

5. Control Panel cables shall be neatly routed with slack and each cable shall have printed labels 6-inches from each end.

6. Control Panel spare cables shall be securely tucked away with slack, clearly labeled and with all cable ends capped.

7. Every motion sensor shall be monitored via Power Distribution Module individually fused to protected outputs as required.

8. Control Panel shall be powered by a hardwired wall mounted UL listed power supply.

9. Auxiliary Power Output:

a. 9.6VDC-13.8VDC, 750mA max.

b. For UL installations, the accessories connected to the output must be UL Listed, and rated to operate in the above voltage range.

10. Backup Battery is required

C. Input Modules

1. Eight-zone expander that allows the use of available expansion zones on the Intrusion Detection System.

2. Input Modules shall be wall mounted in the “SR” room(s) as required.

3. Every motion sensor shall be monitored via Power Distribution Module individually fused to protected outputs as required.
4. Input Modules shall be powered from an external DC power supply UL listed as required.
5. Shall be installed per manufacture's guidelines.

D. Intelligent Relay Board (Lighting Controls)
1. Shall be mounted in the mechanical room in the Intrusion Control Panel location.
2. (1) 18/6 orange plenum cable shall be routed from intelligent relay board to the Lighting Controls Panel and leave 20 feet coiled at the Lighting Controls Panel.
3. Coordinate with the Lighting Controls contractor for the Lighting Controls to pick up the "armed, disarmed, and activated" status points of the Intrusion system.
   a. Interlock with security system to turn off all contactor controlled fixtures upon arming of system.
   b. Interlock with security system to turn on all contactor controlled fixtures upon intruder activation.
   c. Interlock with security system to enable partial lighting when system is first disarmed via contactor schedule.
   d. Intent is to have three inputs from security system: armed, disarmed and activated.
   e. The security integrator needs to provide 3 inputs from the intrusion panel for the three conditions noted in a, b, & c. noted above.
4. Shall be installed per manufacture's guidelines.

E. Power Supplies/Charger/Battery Backup
1. Provide U.L. Listed power supplies for all Intrusion Detection System equipment as specified.
2. Provide power supplies with battery chargers and back-up batteries.
3. Shall be installed per manufacture's guidelines.

F. Power Distribution Module Board
1. Shall securely mounted be in UL listed enclosure.
2. Shall be installed per manufacture's guidelines.

G. Battery
1. Shall securely mounted be in UL listed enclosure.
2. Batteries shall have the installation date clearly labeled with printed labels.
3. Batteries shall be on anti-static pads as required.
4. Shall be installed per manufacture's guidelines.

H. Keypad
1. A multifunctional keypad shall be utilized as a user interface for arming, disarming, monitoring, troubleshooting, and programming the alarm control panel.
2. Orange plenum rated 18 AWG / 4-Conductor as required.
3. Shall be installed per manufacture's guidelines.

I. Motion Detection Devices
1. The IDS shall consist of interior, exterior, and other detection devices that are capable of:
   a. Locating intrusions at individually protected asset areas or at an individual portal.
   b. Locating intrusions within a specific area of coverage.
   c. Locating failures or tampering of individual sensors or components.
2. Provide and adjust for devices so that coverage is maximized in the space or area it is installed in. For large rooms where multiple devices are required, ensure device coverage is overlapping.

3. Detection sensitivity shall be set up to ensure maximum coverage of the secure area is obtained while at the same time limiting excessive false alarms due to the environment and impact of small animals. All detection devices shall be anti-masking with exception of video motion detection.
4. TriTech sensor technology shall be used when possible. Sensor technology shall not be of the same type that is easily defeated by a single method. This will reduce the amount of false alarms.
5. Environmental Conditions: Systems shall be able to operate in environmentally protected interior and/or exterior areas and shall meet operational performance requirements for the ambient conditions.

J. Panoramic 360 Ceiling Motion Sensors

1. Provide 360 Ceiling Motion Sensors as indicated on drawings to monitor movement and create alarm condition upon detection when device is armed.
2. Provide the manufacturer recommended power supply. The power supply shall be UL Class 2, power limited.
3. Every motion sensor shall be monitored via Power Distribution Module individually fused to protected outputs as required.
4. Ceiling Motion Sensors shall be mounted on drop tile as indicated on TS Typical Details sheets.
5. Orange plenum rated 18 AWG / 4-Conductor as required.
6. Shall be installed per manufacture’s guidelines.

K. TriTech Technology Motion Sensor

1. Provide TriTech technology motion sensors as indicated on drawings to monitor movement and create alarm condition upon detection when device is armed.
2. Provide the manufacturer recommended power supply. The power supply shall be UL Class 2, power limited.
3. Every motion sensor shall be monitored via Power Distribution Module individually fused to protected outputs as required.
4. TriTech Technology Motion Sensor shall be wall mounted as indicated on TS Typical Details sheets.
5. Orange plenum rated 18 AWG / 4-Conductor as required.
6. Shall be installed per manufacture’s guidelines.

L. Long Range Motion

1. Provide TriTech Long Range Motion technology motion sensors as indicated on drawings to monitor movement and create alarm condition upon detection when device is armed.
2. Provide the manufacturer recommended power supply. The power supply shall be UL Class 2, power limited.
3. Every motion sensor shall be monitored via Power Distribution Module individually fused to protected outputs as required.
4. TriTech Technology Long Range Motion shall be wall mounted as indicated on TS Typical Details sheets.
5. Orange plenum rated 18 AWG / 4-Conductor as required.
6. Shall be installed per manufacture’s guidelines.

M. Door Position Switches

1. Provide normally closed magnetic concealed door position switches, surface mount door position switches and overhead door position switches to monitor the open/closed status of doors as specified herein and as indicated on the drawings.
2. Provide armored cable (as required) from the switch location to the associated junction box in order to conceal the wire.
3. Orange plenum rated 22 AWG / 2-Conductor as required.
4. Shall be installed per manufacture’s guidelines.

N. Duress Button

1. Shall be under desk mounted with flex conduit neatly secured to desk with security screws.
2. Orange plenum rated 18 AWG / 4-Conductor as required.
3. Shall be installed per manufacture's guidelines.
4. Duress Button shall call FBISD PD when in alarm mode.

O. Tamper Switches

1. The following IDS sensors shall be used to monitor and detect potential tampering of sensors, control panels and enclosures.
2. Tamper Switches: All enclosures including cabinets, housings, boxes, raceways, and fittings with hinged doors or removable covers containing circuits and power supplies related to the IDS shall include corrosion-resistant tamper switches.
3. Tamper alarms shall be annunciated to be clearly distinguishable from IDS alarms.
4. Tamper switches will not be in a viewable from a direct line of sight perspective. The minimum amount of time the tamper switch becomes active and sends a signal after an enclosure is opened or panel removable is attempted, shall be one (1) second.
5. Tamper switches will initiate when enclosure doors or covers is removed as little as 6.35 mm (1/4 inch) from the closed position unless otherwise indicated. Tamper switches shall be:
    a. Push/pull automatic reset type
    b. Inaccessible until switch is activated
    c. Spring-loaded and held in closed position by door or cover
    d. Wired to break a circuit when door or cover is removed
6. Fail-Safe Mode: Shall provide the capability to detect and annunciate diminished functional capabilities and perform self-tests. Fail-safe alarms shall be annunciated to be clearly distinguishable from other types of alarms.
7. Orange plenum rated 22 AWG / 2-Conductor as required.
8. Shall be installed per manufacture's guidelines.

P. Intrusion Detection Cabling - orange jacket (no exceptions)

1. Pathways
    a. Wires shall be routed utilizing the pathways as indicated in the technology and security drawings. Reference Division 27 specifications for additional requirements.
    b. Intrusion detection cabling shall be routed separate from the network data communication cables specified in Division 27. Contractor shall provide separate pathways and j-hooks for the cables specified herein.
2. Wiring Techniques
    a. All cables shall be pre-tested for shorts prior to final device terminations after cables are installed.
    b. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored in the provided enclosure(s) as detailed in the drawings. If an enclosure is not provided for the specified devices herein, the service loop shall be installed on a j-hook in the nearest accessible ceiling space closest to the device.
    c. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored at the intrusion detection panel.
    d. The Contractor shall install a 10-foot service loop to be coiled, mounted, and stored on the wall in the regional mechanical room(s).
    e. Install code compliant fire proofing techniques for all penetrations of fire rated partitions and slabs, where the penetrations are made by or used for installation of the ACS.
    f. All wire and cable shall be continuous from device location to the final point of termination ("Home Run"). No mid-run cable splices shall be allowed.

g. Wire and cable within control panels, power distribution cabinets and other security enclosures shall be neatly installed, completely terminated, pulled tight with slack removed and routed in such a way as to allow direct, unimpeded access to the equipment within the enclosure. All wire and cable shall be bundled and tied. Velcro cable ties shall be utilized.

h. Neatly bundle and wrap all horizontal / vertical runs (above accessible ceilings and not within conduit) wire and cable at intervals as code requires. Provide supports as required. All supports shall be UL listed for the application.

i. All system wiring within vertical riser shafts (as required) shall be bundled, wrapped, and tied to the structure at one-meter intervals in order to isolate it from other wire and cable within the shaft. Additionally, all wire and cable within the shaft shall be supported at least every two floors using manufacturer approved vertical management hardware and installation methods. Provide all personnel and equipment necessary to install and support the cable. All equipment shall be UL listed for the application.

j. Provide grommets and strain relief material where necessary to avoid abrasion of wire and excess tension on wire and cable.

3. Splices / Transitions

a. Home run cabling is the preferred method of installation for all Intrusion detection System devices and panels.

b. In the unlikely event that a splice or transition is required, the Contractor shall identify all splices / transition points required for the completion of the project and confirm, in writing, in advance, via RFI with the Architect / Design Consultant for acceptance of the proposed wiring techniques to be utilized.

c. By not submitting an RFI, Contractor acknowledges that no major splicing is required for the completion of this project. Any splices not previously identified that are found to be faulty shall require the Contractor to re-install the affected cable in its entirety at no cost to the Owner.

d. Contractor shall clearly mark splices / transition points on the shop drawings and As-Built drawings as part of the project close-out.

4. Cable Dressing

a. No excessive cable slack shall be left in enclosures.

b. Cables shall be dressed in a professional manor.

c. Cables shall be routed in 90-degree angles to termination points inside enclosures.

d. Ty raps / zip ties are not permitted, hook and loop / Velcro is acceptable.

e. Exposed wires are not acceptable.

f. Enclosures and equipment / Telecommunication room shall be left clean without debris including but not limited to: labels, connectors, screws, etc.

g. All spare / unused cables shall be in the enclosure shall be neatly coiled and protected to avoid any shorts to ground.

Q. Labeling

1. Contractor shall verify room numbers and confirm the final room numbering scheme and Owner’s current standard in writing in advance via RFI prior to generating any labels.

2. Cables overall sheath shall be labeled within (6) inches from the point the cable enters/exits the enclosure inside the Equipment Room / Telecommunications / Security Control Location Rooms.

3. Cables shall be labeled within (1) inch from the termination point inside the Equipment Room / Telecommunications / Security Control Location Rooms.

4. Cables shall be labeled within (1) inch from the termination point at the device end.

5. Cables shall be labeled identically at both ends.

6. Label all controls as necessary to agree with their function.

7. All labeling in the field shall match the same labeling scheme in the closeout documents.

R. Fire Stop / Smoke / Sound Sealants

1. Use proper sealant as recommended by the manufacturer for the specific application in compliance with per all applicable codes: City, State, Federal, LAHJ.
2. All existing pathways shall be resealed in compliance with per all applicable codes: City, State, Federal, LAHJ.

S. Grounding and Bonding

1. The Contractor shall ensure metal-to-metal contact for all grounding terminations.
2. All materials shall be UL Listed.
3. All connections shall be made with UL Listed compression 2-hole lugs.
4. Contractor shall use an anti-oxidation compound on all connections.
5. In a metal frame (structural steel) building, where the steel framework is readily accessible within or external to the room; each TMGB and TGB shall be bonded to the vertical steel metal frame using a minimum # 6 AWG plenum rated green insulated conductor.
6. A Grounding Equalizer conductor shall be installed when required by ANSI/TIA/EIA-607-B (Interconnects multiple TBBs on the top floor and every 3rd floor in between).
7. The connection to building steel does not eliminate the requirement for the TBB or EBC to the service ground.
8. Equipment Bonding Conductor (EBC)
    a. Contractor shall furnish and install a minimum #6 AWG plenum rated green insulated conductor from the TMGB or TGB as applicable to each ladder rack system, equipment rack, cabinet, metallic raceway, lightning protector, or multi-pair cable with a metallic element. Contractor shall use an anti-oxidation compound on all connections.
    b. When exceeding (13) feet the EBC shall be sized at (2) kcmil per linear foot of conductor length up to a maximum of 750 kcmil.

T. Conduit, Boxes and Raceways (For Reference Only - By Division 26)

1. Install all conduit necessary for a complete installation, but not provided for in the Security Drawings, in finished areas concealed in chases, furring’s, concrete slabs and/or above suspended ceilings. No exposed conduit shall be installed within public areas.
2. Conduit shall be carefully installed, properly and adequately supported as required to comply with the requirements outlined herein and as required by the NEC to provide a neat, industry-standard installation. Horizontal conduit runs shall be supported by clamps, pipe straps, special brackets, or heavy iron tie, tied to the black iron structural members supporting the ceiling. Fastening of conduit to masonry walls, floor or partitions require malleable pipe clips with screws and suitable expansion sleeves.
3. All conduits shall be cut accurately to measurements established at the building and shall be installed without springing or forcing.
4. All required inserts shall be drilled-in and all openings required through concrete or masonry shall be saw cut or core drilled with tools specifically designed for this purpose.
5. Swab out and remove all burrs from conduit before any wires are pulled.
6. Lay out and install conduit runs as to avoid proximity to hot pipes. In no case shall a conduit be run within 75 mm of such pipes, except where crossings are unavoidable and then the conduit shall be kept at least 25 mm from the covering of the pipe crossed.
7. Provide fire stops where conduits penetrate fire rated walls and/or floors.
8. All conduit installation, whether run exposed or concealed, shall be approved prior to installation by the Architect.

U. High Voltage (120VAC) Power Requirements (For Reference Only – by Division 26)

1. 120VAC AC power dedicated to security shall be provided by the electrical contractor for the Intrusion detection system as indicated on drawings. Coordinate with the Architect to establish locations of security dedicated 120VAC AC circuits.

2. Connect to the AC power (provided by electrical contractor) and provide UL listed power supplies and transformers to distribute low voltage power to the system components as required.
3. Provide all conduit and wiring from the AC power facilities to the Intrusion detection / Power Supply Enclosures.
4. Provide Mechanical separation to isolate 120VAC wires from other low voltage cabling. Low voltage cabling shall not route over/under/parallel to 120VAC wires.

V. Surge Protection / Lightning Arrestors

1. Protect all exterior or interior devices, control, power, signal cables and conductors that are power surges. Each surge protector shall be UL Listed.
2. Unless otherwise noted, surge protection devices shall be installed at both the edge and head end of the cabling run.
3. Surge devices shall be installed as close as accessibly possible to the equipment they are protecting.
4. Surge Protection shall be properly installed in an accessible ceiling or enclosure space to allow for cable removal during troubleshooting.
5. Include surge protection device locations on as-builts and shop drawings.
6. Provide protection against spikes, surges, noise, and other line problems for all system equipment and components.
7. Properly ground surge protection devices per the manufacturer installation requirements.

3.5 SYSTEM PROGRAMMING AND DATA ENTRY

A. Provide all initial system programming and setup of the IDS including, but not limited to the following:

1. Graphical maps and icons. Coordinate with the Architect to obtain AutoCAD/REVIT architectural backgrounds for implementation as graphical maps. Import all AutoCAD/REVIT background information provided by the Architect and produce a complete set of graphical maps depicting all IDS points.
2. IDS device information. Coordinate all device values and text, including descriptors, alarm messages, map call up and identification with the Architect.
3. Input and output points for the IDS. Coordinate all input and output priorities and text, including descriptors, alarm messages.
4. Contractor shall coordinate with FBISD Design Manager for zoning, global linking, and keypad requirements prior to programming Intrusion Detection System.

B. Enter all data needed to make the Security System operational. Deliver the data to the Owner on data entry forms, utilizing data from the Contract Documents, Contractor's field surveys and all other pertinent information in the Contractor's possession required for complete installation of the database. Identify and request from the Architect any additional data needed to make the Security System fully operational and integrated. The completed forms shall be delivered to the Owner for review and approval prior to the Contractor's scheduled need date.

3.6 TESTING REQUIREMENTS

A. Provide a test report showing the system has been 100% tested and in 100% operational prior to training / demonstration.

B. System Start-Up

1. The Work shall be complete and ready to operate prior to final acceptance.
2. The Architect shall assist in establishing procedural guidelines and in defining terminology and conditions unique to the Owner’s operation.

C. Substantial Completion

1. In order to qualify for the Architect’s consideration of Substantial Completion, the Work must, at a minimum, meet the following requirements:
   a. Installation of all devices must be completed.
   b. All sub-system interfaces must be complete and operational.

2. Substantial Completion shall not be misconstrued as final acceptance of the Work.

D. System Acceptance

1. Final acceptance testing of the Work will be conducted by the Architect.
2. Prior to any final acceptance testing, the Contractor shall submit two sets of preliminary (draft) Record Drawings to the Architect. The preliminary Record Drawings are to be used by the Architect to conduct the system final test.
3. Before system acceptance testing the Security Contractor shall conduct a complete in-house QA/QC test of the entire Intrusion detection System and provide a written report on the results of that test. During the QA/QC test the Security Contractor shall place the ACS in service mode and calibrate and test all equipment.
4. Following completion of the initial testing and correction of any noted deficiencies, conduct a five-day burn-in test. The intent of the burn-in test shall be to prove the Intrusion detection system by placing it in near real operating conditions. During this period, the Intrusion detection system shall be fully functional and programmed such that all points, interfaces, controls, reports, messages, prompts, etc. can be exercised and validated. Record and correct any system anomaly, deficiency, or failure noted during this period. Scheduling of the final acceptance test shall be based on a review of the results of this burn-in test.
5. Deliver a report describing the results of functional tests, burn-in tests, diagnostics, calibrations, corrections, and repairs including written certification to the Architect that the installed complete Intrusion detection system has been calibrated, tested, and is fully functional as specified herein.
6. Prior to the final acceptance test, coordinate with the Architect for security related construction clean-up and patch work requirements. Security equipment closets and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, remove all waste materials, rubbish, the Contractor’s and its subcontractors’ tools, construction equipment, machinery, and all surplus materials.
7. Upon written notification from the Contractor that the Intrusion detection system is completely installed, integrated and operational, and the burn-in testing completed, the Architect will conduct a final acceptance test of the entire system.
8. During the course of the final acceptance test by the Architect, the Contractor shall be responsible for demonstrating that, without exception, the completed and integrated system complies with the contract requirements. All physical and functional requirements of the project shall be demonstrated and shown. This demonstration will begin by comparing “as built” conditions of the Intrusion detection system to requirements outlined in the Specification, item by item. Following the Specification compliance review, all Intrusion detection system head-end equipment will be evaluated.
9. The functionality of the various interfaces between systems will be tested.
10. Following the Intrusion detection system head-end equipment and console review, the installation of all field devices will be inspected. This field inspection will weigh heavily on the general neatness and quality of installations, complete functionality of each individual device, and mounting, backbox and conduit requirements compliance.
11. All equipment shall be on and fully operational during any and all testing procedures. Provide all personnel, equipment, and supplies necessary to perform all site testing. Provide a minimum of two employees familiar with the system for the final acceptance test. One employee shall be responsible for monitoring and verifying alarms while the other will be required to demonstrate the function of each device. Supply at least two two-way radios for use during the test. A manufacturer’s representative may be present on site to answer any questions that may be beyond the technical capability of the Contractor’s employees, if the Contractor so elects or by specific request of the Architect or Owner, at no charge to the Architect or Owner.
12. Upon successful completion of the final acceptance test (or subsequent punch list retest) the Architect will issue a letter of final acceptance.
13. The Architect retains the right to suspend and/or terminate testing at any time when the system fails to perform as specified. In the event that it becomes necessary to suspend the test, all of the Owner’s/Architect’s fees and expenses related to the suspended test will be deducted from the Contractor’s retainage. Furthermore, in the event it becomes necessary to suspend the test, the Contractor shall work diligently to complete/repair all outstanding items to the condition specified in the Specification and as indicated on the Drawings. The Contractor shall supply the Architect with a

detailed completion schedule outlining phase by phase completion dates and a tentative date for a subsequent punch list retest. During the final acceptance test, no adjustments, repairs, or modifications to the system will be conducted without the permission of the Architect.

3.7 TRAINING

A. Provide for (4) hours of training for two (2) persons on each system.

B. Provide a test report showing the system has been 100% tested and 100% operational prior to training / demonstration.

C. Coordinate with the Owner to establish a training outline and schedule. Submit a comprehensive training curriculum to the Owner once all preliminary coordination is complete. The Owner will revise and comment on the curriculum as required.

D. Operator training shall include, but not be limited to the following:

1. All operating procedures
2. System configuration
3. Alarm acknowledgement, alarm response logging

E. Administrative training shall include, but not be limited to the following:

1. All operating system procedures and configuration variables
2. Report generation

F. Record, label, and catalog all training on DVD and “user’s manual” written specifically for the school personnel onsite, for daily routine operations of the systems. Provide the DVD and user’s manual to the Owner for future in-house training sessions and / or reviews. Furnish all temporary equipment necessary for recording all training sessions. Maintain accurate and up-to-date time sheets of all training sessions.

G. The Contractor shall be on call during the Warranty to answer any questions the Owner might have. The Owner reserves the right to use any excess training hours, not used by the time of system completion, for future training as requested by the Owner until the total number of training hours has been completed.

H. The Contractor shall be on call during the Warranty to answer any questions the Owner might have. The Owner reserves the right to use any excess training hours, not used by the time of system completion, for future training as requested by the Owner until the total number of training hours has been completed.

3.8 PROJECT CLOSEOUT DOCUMENTATION REQUIREMENTS

A. As-Built Drawings

1. As built drawings for the security systems must include model number, serial number, and installed location for each security device (i.e., keypad, motion sensor, door contact, etc.)
2. Electronic pdf as-built drawings will be required for final closeout. Close out drawings must include final installed locations, model numbers and serial numbers of all installed equipment.
3. Drawings shall be provided to the Architect / Owner / Design Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Architect / Owner / Design Consultant.
4. Unless otherwise requested, Contractor shall provide digital copies of close-out documents, and deliver to the Architect / Owner / Design Consultant electronically.
5. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
6. Drawings shall be provided in the original size as issued by the Architect / Design Consultant.
7. Drawings shall retain the formatting and title block of the original drawings as issued by the Architect / Design Consultant.
8. Provide a conformed set of Drawings as related to the project, depicting the condition of the intrusion detection system as installed to include but not limited to:
    a. ASI, PR and Addendum items installed throughout the duration of the project.

9. Provide a hard copy of the conformed set of drawings to be physically stored at the end of the project in a designated Intrusion detection System enclosure. Coordinate with Owner for final storage location.
10. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of the following not limited to:
    a. Intrusion detection System Riser / Signal Flow Diagrams
    b. Intrusion detection System Backboard Layouts
        1) To include intrusion detection boards, power supplies, pathways, etc.
    c. Sleeves, Backbone Cabling and Communication pathways
    d. Intrusion detection System device locations and labeling scheme.

B. Operation & Maintenance Manuals
1. Unless otherwise noted, provide O&M manuals electronically to Owner to include all drawings, product datasheets, hardware manuals as related to the project.
2. Coordinate with the Owner for provisioning of physical storage devices (Hardcopy, Flash Drive, CD/DVDs)

C. Manufacturer’s Product Warranty
1. Certificate of product warranty shall be provided to the Architect / Owner / Design Consultant at the time of final system acceptance. Final payment will not be recommended until this certificate of product warranty is received and approved by the Architect / Design Consultant.
2. The manufacturer of the solution shall furnish a product warranty as per the specifications starting at final system acceptance.
3. One original and two copies of the Manufacturer’s product warranty shall be provided.

D. Contactor’s Statement of Warranty
1. Statement of warranty shall be provided to the Architect / Design Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Architect / Design Consultant.
2. Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor and workmanship starting at final system acceptance.
3. One original and two copies of Contractor’s warranty terms and conditions to include contact information (i.e., Contractor name, Point of Contact, address, phone number and email address) and start and end date for warranty call outs.

END OF SECTION 281600

SECTION 282300 - VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This section identifies the requirements, technical design, and specifications for the Video Surveillance system at the Fort Bend ISD Willowridge HS Renovations, located in Houston, Texas (“Owner”). The video surveillance system as specified is an industry standard and it shall be an extension of the District’s existing system which includes network video recorder(s)/server(s) (existing), software (existing), licenses, cameras, mounts, and cabling as specified.

B. It is the Contractor’s responsibility to review this specification and associated project specifications and drawings in their entirety, prior to bidding on the project. By bidding on this project, the contractor acknowledges that they have read and fully understand these specifications, with no exceptions. Contractor shall review the drawings, specifications, and existing conditions prior to bidding on the project. Any discrepancies shall be brought to the attention of the architect/Design Consultant via request for information (RFI) in writing for evaluation and or clarification. If these items are not brought to the attention of the architect/Design Consultant the more costly or difficult manner, and the better quality or greater quantity of work shall be provided by the contractor in accordance with the architect's/Design Consultant's interpretation at no additional cost to the owner. Contractor shall verify the installation methodology of each device location prior to proceeding with installation. Potential obstructions or mounting conflicts due to changing conditions shall be identified via written RFI for approval with the Owner / Architect / Design Consultant.

C. Contractor shall furnish and install all materials, equipment, and labor necessary to provide a complete and functional turn-key Video Surveillance system regardless of any items not listed or described in this specification or associated drawings.

D. Requirement Sections Table of Contents

1.3 Contractor Experience Requirements

1.4 Submittal Requirements

2.1 Products – General Requirements

2.2 Acceptable Manufacturers

3.1 Codes, Standards and Regulations

3.2 Execution - General Requirements

3.3 Coordination Requirements

3.4 System Requirements

3.5 Testing Requirements

3.6 Training Requirements

3.8 Substantial Completion

3.9 Project Closeout Documentation

1.2 RELATED REQUIREMENTS

A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division 1 apply to the work specified in Division 28 and shall be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.

1.3 CONTRACTOR EXPERIENCE REQUIREMENTS

A. The Contractor shall be a certified Panasonic / Video Insight Video Management System Preferred Partner prior to submitting a bid for the work.

B. The Contractor shall possess all relevant Panasonic / Video Insight Manufacturer Certifications (i.e., video surveillance systems, hardware installation, software installation and programming) for both the company and individual technicians prior to submitting a bid for the work.

C. The Contractor shall have a Panasonic / Video Insight manufacturer certified technician onsite throughout the duration of the installation phase of the project.

D. The Contractor's Project Manager shall be dedicated to this project for the duration of the project and shall be available for all onsite coordination meetings.

E. The Contractor shall have been in business for a minimum of five (5) years.

F. The Contractor shall have a local office with local technicians and an adequate workforce to complete this project within a 75-mile radius of the project site.

G. The Contractor shall have completed a minimum of five (5) projects similar in size and scope to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year.

H. Licensed in the State of Texas.

I. Submitting Contractor must be certified to install products and services for systems they are proposing. No subcontract of services will be allowed for any security scope of work. Contractor must submit to the Owner prior to starting any work the factory training certifications for all personnel that will be working on the system.

1.4 SUBMITTAL REQUIREMENTS

A. Bid / Proposal Submittal

1. Contractor shall provide as part of their bid/proposal:

a. Breakdown of proposed parts and labor required for the completion of the project. Include documentation showing annual licensing cost of ownership.

b. Proposed construction schedule in a Gant chart format

c. Contractor Safety Plan detailing safety practices around the jobsite.

d. Contractor QA / QC process detailing processes and procedures to ensure quality workmanship during installation and troubleshooting.

e. A detailed description of the installation team(s) that would perform the work.

f. A resume for each of the key project personal.

B. Pre-Installation Submittal

1. Contractor shall not order, purchase, or install any equipment until pre-installation submittals have been accepted in writing by the Architect / Design Consultant / Owner.

2. The Contractor is responsible for notifying and obtaining written approval via RFI from the Architect / Design Consultant / Owner of any proprietary devices, software, and/or installation processes.

3. Contractor is responsible for obtaining permitting as required in accordance with the authority having jurisdiction (AHJ), local, city, state, federal, and/or applicable law requirements.

4. Contractor shall ensure submittals are submitted in 15 business days of award to ensure all products can be ordered and received on site in order to not cause any delays. Any products having long lead times (more than 60 days) that may negatively impact the schedule shall be clearly identified in writing so the review and approval can be expedited.

5. All submittals shall be submitted in the same sequence as they are listed in the specifications (i.e., product data in the sequence items are listed in the product data section, manufacturer product certifications for company, manufacturer product certifications for installers, etc.). Submittals not in the proper sequence will not be approved.

6. Contractor shall provide the following as part of their submittal:

a. Manufacturer product data sheets for each proposed system component.

1) For product data sheets containing more than one (1) part number or product, the Contractor shall clearly identify the specific part number or product being submitted. Product data sheets without the part number clearly identified will not be approved.

2) Contractor shall identify any products that are discontinued, end of life, or near end of life, and shall propose equal alternate to the discontinued product in writing.

b. Manufacturer Product Certifications for Company.

c. Manufacturer Product Certifications for Installers.

d. Manufacturer Warranty letters.

e. Documentation indicating that Contractor has been in business for (5) years.

f. Address of Contractor's local office within a 75-mile radius of the project site.

g. Quantity of full-time, local technicians within a 75-mile radius of the project site.

h. List of five (5) contractor-installed projects of a similar size and scope that have been in operation for at least (1) year. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, Brief Description of Project, Client Point of Contact Name and Phone Number.

i. List of completed and ongoing projects with the Owner. The Contractor shall provide the following information for each project: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, and Brief Description of Project.

j. List of subcontractors performing any work on the project. List shall clearly identify the subcontractor's legal name and address, the scope of work to be performed by the subcontractors and the overall percentage of the project being provided by the subcontractor. If there are no subcontractors performing any work on the project, submit a statement on company letterhead clearly indicating no subcontractors will be performing any work on this project.

k. Manufacturer's Certification Letter confirming that the proposed video surveillance system components do not have any known cybersecurity notices, bulletins, or alerts. If a vulnerability is discovered, the contractor shall notify the Architect / Design Consultant / Owner within 24 business hours. Provide the make and model of the associated equipment and the vulnerability.

l. Manufacturer Cybersecurity Hardening Guide. If one is not available, provide documentation from the manufacturer stating such.

m. A complete set of shop drawings to include at a minimum but are not limited to:

1) Proposed and/or samples of original contractor security schedules. Schedules are not to be copy/paste of schedules provided within the contract documents. Schedules proposed shall be utilized as part of As-Built drawings with coordination with Div. 27 for additional information as required for network components.

a) Device and equipment schedules shall include at a minimum but are not limited to:

(1) Device Label

(2) Device Type

(3) Device Power Requirements

(4) Terminating MDF / IDF / Panel Location

b) Additional networking information as required to include:

(1) Rack

(2) Network switch

(3) IP addresses

(4) Patch panel

(5) Surge/lighting protection

(6) Power source

2) Elevation and Topography Drawings to illustrate the associated devices and equipment and the heights at which they will be installed.

3) Signal Flow Diagram including full security topology.

n. Supplemental documents to include at a minimum but are not limited to:

1) Contractor Safety Plan detailing steps Contractor will take to ensure a safe work environment.

2) Contractor QA/QC Document to include bench testing / initial configuration of all critical system components including but not limited to:

a) System Server(s)

b) Cameras

c) Contractor Furnished Workstations (if applicable)

3) Construction Schedule in a Gant chart format

4) Contractor Cybersecurity Hardening Guide detailing Contractor's internal policies for preventing the introduction of cyberthreats to the Owner's technology / security infrastructure.

a) Contractor Certification Letter utilizing company letterhead detailing the company policies and procedures.

b) Contractor shall provide a cybersecurity plan detailing their internal policy for preventing the introduction of cyberthreats to the Owner's technology / security infrastructure.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The following sections specifically list the acceptable equipment types and items for this project.

B. All software, hardware, and equipment (from the date of RFP) shall be tested, currently available and commercially off the shelf product. (COTS).

C. All wiring, equipment, and installation materials shall be Commercial Grade, new, and of the highest quality to meet or exceed the performance and features of the equipment and devices specified herein.

D. Written approval must be obtained from the Architect / Design Consultant / Owner for any proprietary or custom software and/or equipment prior to the beginning of the project.

E. All devices shall be installed with the manufacturer recommended mounts and accessories as necessary for the installation locations type as scheduled.

F. Unless otherwise stated, all software and licensing shall be for the most current, up to date version of the system provided. For existing systems, Contractor shall obtain written verification of the Owner's most current software version and notify via RFI the Architect / Design Consultant / Owner if implementation of the most current software / license version will require an upgrade to the Owner's existing system.

G. Architect / Design Consultant / Owner will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to purchase or installation.

H. Proposed equivalent items must be approved in writing by the Architect / Design Consultant / Owner prior to purchase or installation. Proposed equivalent items must meet or exceed these specifications and the specifications of the specified item.

I. In the event a manufacturer's specified product or part number has changed or is no longer available, Contractor shall submit a formal RFI for an appropriate substitute.

J. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished at no additional cost to the owner.

K. For listed products with no part number specified, Contractor shall provide a product that meets the performance requirements of these specifications, industry standard practices, and intended application.

L. Labels on all cabling, materials, and equipment must indicate a nationally recognized testing laboratory.

M. Contractor shall review all products specified and required for this project to determine if there are any lead times for any products that may cause any delay. Contractor shall clearly identify any

concerns with lead times in writing to the Architect / Design Consultant / Owner. If the Contractor does not identify any concerns with products having long lead times, it will be understood there are no long lead time issues and the Contractor will have all products on-site when needed to complete the job as per the project schedule.

N. Any quantities listed are for reference only, contractor is responsible for furnishing materials as required to provide a fully functional turkey system. Where quantities are not noted, Contractor shall refer to drawings and schedules to determine exact quantities.

2.2 ACCEPTABLE MANUFACTURERS

A. Electronic Surveillance System Software
   1. Video Insight

B. Electronic Surveillance System Licensing
   1. Video Insight unlimited license per camera - (As required)
      a. IPSVC-UL (Most Current Version)

C. Electronic Surveillance System Server
   1. Network Virtual Centralized Server / Storage
      a. Owner Furnished / Owner Installed (OFOI)

D. Surveillance Cameras
   1. Interior 5 MP Dome with IR
      a. i-PRO WV-S22500-V3L
      b. Or approved equal
         1) Acceptable Mounts
            a) Wall Mount
               (1) i-PRO WV-QWL500-W
            b) Adapter Box
               (1) WV-QJB500-W
            c) Ceiling Tile Support
               (1) Caddy – 512HD (By Div. 26)
               (2) Double Gang Backbox (By Div.26)
               (3) Dual Gang Mud Ring (By Div. 26)
   2. Interior 360 Degree Fisheye 5MP Camera
      a. Panasonic WV-S4156
      b. Or approved equal
         1) Acceptable Mounts
            a) Wall Mount
               (1) i-PRO WV-QWL500-W
               (2) i-PRO PWM485W
            b) Adapter Box
               (1) WV-QJB500-W
            c) Ceiling Tile Support
               (1) Caddy – 512HD (By Div. 26)
               (2) Double Gang Backbox (By Div.26)
               (3) Dual Gang Mud Ring (By Div. 26)

3. Exterior Fixed 5 MP (Indoor/Outdoor, Day/Night) Vandal Dome
    a. i-PRO – WV-S25500-V3LN
    b. Or approved equal
        1) Acceptable Mounts
            a) Mount
                (1) i-PRO WV-QWL500-W
                (2) i-PRO PWM485W
            b) Adapter Box
                (1) WV-QJB500-W
4. Exterior Multi-sensor Camera 33MP (4K x 4) w/ IR-LED *(Camera Manufacture's label / /logo shall be installed with facing towards the center of main fields of views for best adjustment purposes. Coordinate proper mounting requirements with FBISD Security Manager)*.
    a. i-PRO – WV-S8574L
    b. Or approved equal
        1) Acceptable Mounts
            a) Wall Mount
                (1) i-PRO PWM40W
            b) Pendant Cap
                (1) i-PRO WV-QSR503F1-W
            c) Pole Mount
                (1) i-PRO PAPM4W
            d) Corner Mount
                (1) i-PRO PACA4W

E. Power Equipment
    1. PoE Switch - (OFOI)
F. Surge Protection
    1. By Division 27 10 00
G. Video Surveillance System Cabling
    1. By Division 27 10 00
H. IP Cameras – Plenum rated - Orange Cable Jacket
I. Pathway Cable Support
    1. Pathway Cable Support installed by others.
J. Labeling
    1. Permanent Labels for Copper Cables
    2. Panduit Self-Laminating Labels
    3. Or approved equal.
K. Fire Stop
    1. STI Spec Seal
    2. 3M Products
    3. Or approved equal.

PART 3 - EXECUTION

3.1 CODES, STANDARDS, REGULATIONS

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

1. ASTM B 1 (2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
2. ASTM B 8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
3. ASTM D 1557 (2007) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
4. ASTM D 709 (2001; R 2007) Laminated Thermosetting Materials

C. Alliance for Telecommunications Industry Solutions (ATIS)

D. Building Industry Consulting Service International (BICSI)

1. Telecommunications Distribution Methods Manual 13th Edition
2. Outside Plant Design Reference Manual 5th Edition
3. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices
4. NECA/BICSI 568-2006 – Standard for Installing Commercial Building Telecommunications Cabling
5. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

E. Federal Communications Commission (FCC)

1. FCC Part 15, Radiated Emissions Limits, revised 1998
2. FCC Part 68, Connection of Terminal Equipment to the Telephone Network, revised 1998
3. FCC Part 76, Cable Television Service, revised 1998

F. Insulated Cable Design Consultants Association (ICEA)

1. ICEA S-87-640 (2006) Fiber Optic Outside Plant Communications Cable
2. ICEA S-98-688 (2006) Broadband Twisted Pair, Telecommunications Cable Aircore, Polyolefin Insulated Copper Conductors
3. ICEA S-99-689 (2006) Broadband Twisted Pair Telecommunications Cable Filled, Polyolefin Insulated Copper Conductors

G. International Electrotechnical Commission (IEC)

H. Institute of Electrical and Electronics Design Consultants, Inc. (IEEE)

1. IEEE Standard 81-1983, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System
2. IEEE Standard 1100-1999, Recommended for practice for Powering and Grounding Sensitive
3. Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)
4. IEEE C2 (2007; Errata 2007; INT 2008) National Electrical Safety Code
5. IEEE Std 100 (2000) The Authoritative Dictionary of IEEE Standards Terms

I. International Organization for Standardization (ISO)

1. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)
2. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
3. ISO/IEC 14443-3:2011 – Identification Cards
4. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer Premises Cabling-Administration, 1999

J. National Cable Television Association (NCTA)

K. National Electrical Contractors Association (NECA)
   1. NECA 1-2015 Good Workmanship in Electrical Construction
L. National Electrical Manufacturers Association (NEMA)
   1. NEMA C62.61 (1993) Gas Tube Surge Arresters on Wire Line Telephone Circuits
M. National Fire Protection Association (NFPA)
   1. NFPA-70, National Electrical Code
   2. NFPA-75, Protection of Electronic Computer Data Processing Equipment.
   3. NFPA-101, Life Safety Code
   4. NFPA-297, Guide on Principles and Practices for Telecommunications Systems
   5. NFPA-780, Standard for the Installation of Lightning Protection Systems.
N. National Institute Standards and Technology (NIST)
O. Occupational Safety and Health Administration (OSHA)
P. Security Industry Association (SIA)
Q. Telecommunications Industry Association (TIA)
   1. ANSI/TIA-568.0-D-1, Generic Telecommunications Cabling for Customer Premises.
   2. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard.
   3. ANSI/TIA -568.0-D.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard.
   4. ANSI/TIA-568.3-D-1, Optical Fiber Cabling Components Standard.
   5. ANSI/TIA–569-E Commercial Building Standard for Telecommunications Pathways and Spaces.
   6. ANSI/TIA-606-C, Administration Standard for the Telecommunications Infrastructure.
   7. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
   8. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.
R. U.S. Department of Agriculture (USDA)
   1. RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment and Construction
   2. RUS Bull 1751F-643 (2002) Underground Plant Design
   3. RUS Bull 1751F-815 (1979) Electrical Protection of Outside Plant
   4. RUS Bull 1753F-201 (1997) Acceptance Tests of Telecommunications Plant (PC-4)
   5. RUS Bull 1753F-401 (1995) Splicing Copper and Fiber Optic Cables (PC-2)
   6. RUS Bull 345-65 (1985) Shield Bonding Connectors (PE-65)
   7. RUS Bull 345-72 (1985) Filled Splice Closures (PE-74)
   8. RUS Bull 345-83 (1979; Rev Oct 1982) Gas Tube Surge Arrestors (PE-80)
S. Underwriters Laboratories, Inc. (UL)
   1. UL 294 Standard for Video Surveillance System Units
   2. UL 294B Standard for Power Over Ethernet (PoE) Power Sources for Video Surveillance Systems and Equipment
   3. UL 109 Standard Method for Flame Tests of Flame-Resistant Fabrics and Films
   4. UL 1076 Standard for Proprietary Burglar Alarm Units and Systems

3.2 EXECUTION - GENERAL REQUIREMENTS

A. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), State of Texas, the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the aforementioned laws, ordinances, and rules, the matter shall be referred to the Architect / Design Consultant for direction before proceeding with that part of the work.

B. Contractor shall meet the specifications and standards from the latest NFPA and NEC publications. In the event of any conflicts between Standards and Codes the more stringent shall take precedence.

C. The Contractor shall install the materials in accordance with these specifications and the manufacturer's installation guidelines. Equipment and materials installed by the Contractor shall be free of defects and damage.

D. No deviations from the plans, details or specifications shall be made without full consent in writing of the Architect / Design Consultant. The Contractor shall have written approval from the Architect / Design Consultant for any additional work beyond the Contract Documents prior to beginning such work.

E. Prior to execution, Contractor shall verify no changes in software, licensing or hardware versions have occurred since the bidding of the project. In the event of any changes, Contractor shall verify system compatibilities with their proposed design, and notify via RFI the Architect / Design Consultant / Owner if the newest version(s) will require any upgrades / additional costs to the existing system(s).

F. In the event site conditions do not allow the contractor to follow the execution requirements specified herein or in the provided details, the Contractor shall submit via RFI an alternative means and methods that is approved in writing by the Architect / Design Consultant / Owner.

G. The Contractor shall obtain written permission from the Architect / Design Consultant / Owner before proceeding with any work that would necessitate cutting into or through any part of the building structure such as, but not limited to: girders, beams, floors, walls, roofs, and/or ceilings.

H. If the Contractor does not obtain written approval from the Architect / Design Consultant / Owner prior to proceeding with the work, the contractor shall not be reimbursed for the work.

I. Contractor shall notify the Architect / Design Consultant / Owner a minimum of (2) weeks prior to beginning work and will participate in a pre-construction meeting with the Architect / Design Consultant / Owner to perform a walkthrough, review the scope of work, schedule, and escalation procedures.

J. The Contractor shall maintain a work area free of debris, trash, empty cable reels, scrap cable, etc., and dispose of such items on a daily basis and return the site to the original state of cleanliness. The Contractor shall not use Owner's facilities for the disposal of excess or scrap materials.

K. Contractor shall be responsible for the repair of any damage caused by the contractor during the installation.

L. Contractor shall test all cables prior to and post installation. By failing to perform this testing operation, the Contractor shall accept the cable as compliant and assume all liability for the replacement of the cable at no cost to the Owner should it be found defective at a later date.

M. Contractor shall maintain a set of working specifications, design drawings, schedules, and record drawings to be kept on site at all times and shall update the record drawings with any changes on a weekly basis. Record drawings shall be made available for inspection at the request of the Architect / Design Consultant / Owner.

N. Equipment and materials shall be consistent throughout the installation. Where multiple units of the same type of equipment and materials are required, these units shall be a standard product with the same manufacturer and model number.

O. Equipment and materials shall be delivered and stored in accordance with the manufacturer's guidelines at the Contractor's expense.

P. Contractor shall make all stored equipment and materials available for inspection at the request of the Architect / Design Consultant / Owner.

Q. All equipment and material used in the installation shall be approved by the manufacturer for the environment in which it is being installed.

R. All devices shall be installed flush, plumb, and (where required) centered on the wall, ceiling tile or structure for which it is being installed, unless otherwise noted.

S. Devices installed in public spaces shall be mounted and secured using tamper-proof security fasteners unless otherwise noted.

T. Cables shall be properly supported in accordance with industry standards at all times. Improperly supported cables shall be corrected by the Contractor at no cost to the Owner.

U. Contractor shall be responsible to properly protect information outlets from damage by other trades during construction.

V. Cables shall be routed at 90-degree angles to the building structure. At no time shall a diagonal pull be installed.

W. The Contractor shall not install cables in conduits or sleeves without nylon bushings. Cables installed through conduits or sleeves without nylon bushings shall be removed and replaced at no cost to the Owner.

X. The manufacturer and contractor shall take positive measures to prevent the introduction of cybersecurity threats to the Owners technology infrastructure. These measures shall include but are not limited to:

1. The contractor shall scan contractor owned equipment for cyber threats such as viruses, malware, ransomware, etc., prior to connecting the contractor owned devices to the Owners network.

2. Ensure all technicians installing or configuring equipment are trained on the prevention of introduction of cyber threats to electronics, i.e., servers, and other associated equipment.

3. All project documents shall be properly securely stored behind encryption and password protection to avoid unauthorized distribution of documents.

Y. All security system cabling shall be orange in color.

Z. All security system cabling shall be plenum rated.

1. All security system cabling shall be installed following the same pathway and support requirements as the Division 27 Communications.

3.3 COORDINATION REQUIREMENTS

A. The Contractor is responsible for the coordination of the following items and their respective disciplines included but not limited to.

B. Coordinate with the Architect to ensure that:

1. Adequate conduit is provided and that equipment backboxes are adequate for system installation.

2. Adequate communication infrastructure and power has been provided and properly located for the security system equipment.

3. Finishes and colors of all equipment visibly installed in public areas. Submit all finish and graphics for all equipment to the Architect for approval prior to installation.

4. Camera views are not obstructed by landscaping, awnings, or any other obstacles.

5. Mounting techniques are in compliance with construction techniques.

6. Camera location and field of views are adequate and meets Owner’s expectations.

C. Coordinate with the Division 26 contractor for the following:

1. Power requirements, conduit sizes/pathways, sleeves, back boxes, grounding, and bonding requirements of security devices in the following locations:

a. Interior of the building

b. Exterior of the building

c. Pole, pedestals, canopies, awnings, building architectural surface, etc.

d. Special conditions (clean room, hazardous areas, roof top mounted devices, etc.).

e. License Plate Recognition (LPR) exact camera placement requirements.

2. Coordinate location and termination of earth ground for all device specified herein as required per manufacturer installation requirements.

D. Coordinate with the Division 27 contractor for the following:

1. Installation and power requirements of network infrastructure associated to the specified system.

2. Associated patch cable lengths and quantities required for the specified system.

3. Location, power, and backup requirements for rack mount equipment.

4. Mounting and installation of injectors, midspans, extenders, surge protectors, etc.

E. The Contractor is responsible for coordinating all VMS programming requirements with the Owner / Architect / Design Consultant.

F. The Contractor shall coordinate with the Owner prior to installation for the following:

1. Network IP addressing for networked system equipment, servers, and devices.

2. Device labeling scheme

3. Firmware/software updates

4. Client workstations requirements and locations

5. Location of rack mount equipment.

6. Locations, type, programming, configuration, and Owner's final expectations for any Contractor Furnished Contractor Installed (CFCI) equipment and devices.

7. Uninterruptible Power Supply (UPS) requirements.

8. Painting of exposed, publicly visible conduit pathways

9. Camera Views (Owner's Written Acceptance Required)

3.4 SYSTEM REQUIREMENTS

A. General

1. The Video Surveillance System (VMS) shall consist of server(s), software, licensing, workstations, cameras, power source, grounding/bonding, Video Surveillance cabling, and all other peripheral components as indicated on the drawing and specified herein.

2. Any devices associated with the installation shall have the latest firmware updates downloads via Owner approved secure link from the system software and/or remotely from the manufacturer.

3. All Video Surveillance software, equipment and system requirements shall be installed per their respective Manufacturer Installation Guidelines.

4. All programming and configuration of the Video Surveillance Systems shall be accomplished by the Security Contractor.

a. The Security Contractor is responsible for all Video Surveillance System (VSS) programming to ensure the installed field devices, cameras, servers, workstations, media converters, etc., are communicating to the head-end equipment.

B. System Configuration:

1. Camera recording and display configurations shall be arranged during the provisioning phase, based on coordination with Owner and the specifications.

2. Contractor shall coordinate with Owner to determine the required pre-programmed surveillance and event-initiated configurations.

C. Graphical User Interface (GUI) Environment

1. General

a. Security Contractor shall create and provide maps for each site and building, and for each floor of the building where VSS devices are provided.

b. The VSS client shall display color graphic maps, menus and real-time information regarding system configuration, camera location and status, in graphical format, as required by Owner and described herein. Contractor shall research icon usage and use same icons through the system.

2. Map Database: Contractor shall research (with Owner), design, develop and provide site and building maps described herein in complete operating condition including graphic representations, icons, alarm and control interfaces.

a. Individual Site Plans: Individual site plan maps shall include the entire site perimeter showing buildings, vehicle and foot traffic features and street frontage. Individual site plans may contain multiple buildings. Large-scale maps shall have dynamic zoom or designated “hot spot” areas to allow the capability to zoom into an area down to 1/8” scale. Site plans shall have icons for exterior mounted devices and entry/exit portals.

b. Building Maps: Building Maps shall include the building footprint and surrounding areas, ground floor plan, a floor stacking plan (elevation) and stairwell risers. Building plans shall have icons for exterior mounted devices and entry/exit portals.

c. Floor Plan Maps: Floor plan maps shall include rooms, corridors, elevators, door and room designations (number and usage), penetrable wall points, column supports, location of access control equipment and any other details necessary to clearly and completely depict the secured environment.

d. Device Icons:

1) Individual site plans, building plans, and floor plan maps shall show text and icons for devices monitored and/or controlled by the DVMS.

2) The maps shall include active icons for video cameras allowing distinction between types, whose individual selection shall be supported via the GUI using the integration schemes described in the specifications.

D. VSS Connectivity

1. Owner Provided Network: Owner shall provide the network infrastructure for security systems, including backbone cabling, routers, network switches, and miscellaneous devices necessary to support and protect the security systems.

2. The Contractor shall coordinate with the IT department and provide IT with detailed network requirements including but not limited to

a. Location and quantity of ports needed by network appliances

b. Bandwidth and throughput requirements at key locations

c. Coordinate IP and MAC addresses required by network appliances

d. Other information as necessary to establish communications and security protection for security systems and devices

3. VSS Network: Base Servers, Network Video Recorders, and Client Workstations shall reside on Owners’ Local Area (LAN) and/or Wide Area Network (WAN) to allow global activity and shared data interchange.

4. Coordinate with the District’s IT department to determine adequate network “firewalls” to maintain the security of VSS controls and information while connected to shared computer networks and transmission media.

E. Video Surveillance System (VMS) Software

1. Server/Client/Workstation/Mobile Application Software

a. The VMS software shall be installed as the most current version; contractor shall coordinate with Owner prior to the upgrade/install to identify and evaluate any software conflicts. Conflicts shall be brought to the attention of the Architect/Design Consultant prior to installation via written Request for Information (RFI). Contractor shall coordinate the install and configure software as required to provide a full turnkey VMS.

F. Video Surveillance System Licensing

1. Contractor shall be responsible for providing and applying all necessary licensing key(s) for the specified system(s) as required by the manufacturer(s) for a fully functioning Video Surveillance System.

2. Contractor shall maintain a secured document with all license key(s) information applicable to this project. All license key(s) are property of the Owner and shall be kept secured at all times and then surrendered to the Owner at the end of the project.

G. Video Surveillance System Hardware

1. Video Surveillance Virtual Central Server

a. OFOI

1) Communications

a) Communication between servers, workstations, and networked based edge devices will communicate using the Owner provided data network unless otherwise noted. Coordinate with Owner for network configuration requirements.

2. Video Surveillance Workstations

a. OFOI

3. Surveillance Cameras

a. The Contractor shall have all on-site equipment, and personnel necessary to install, program, and troubleshoot devices during and after installation.

b. Unless otherwise stated, all cameras shall receive power through Power over Ethernet. Contractor is responsible for ensuring the power output of the network switch will meet the power requirements of the cameras to be installed. Any additional power will be the responsibility of the contractor to provide.

c. The Contractor shall energize and commission equipment in accordance with manufacturer's instructions and guidelines. All installed cameras, mounts, accessories, and fasteners shall be properly rated for the environmental conditions in which they will be installed. Contractor is responsible for sealing and making watertight all exterior penetrations and equipment.

d. The Contractor is responsible for all the initial configuration of camera settings, IP address settings, recording settings, presets, naming conventions, etc. unless otherwise noted.

e. Default admin account usernames and passwords shall be reconfigured prior to connecting to the Owner's network. New admin accounts and passwords shall be Owner Provided. Account passwords and settings shall be held in confidence by the Contractor and secured throughout the duration of the project to prevent unauthorized access.

f. As part of initial installation, Contractor is responsible for focusing and aiming the camera in the direction as indicated in the drawings. Unless otherwise stated, camera lenses shall provide the maximum field of view coverage to the area to provide a usable, level, clear image, pending Owner's final approval. Contractor shall plan for a minimum of one additional trip to make final adjustments of camera field of views.

4. Surge Protection / Lightning Arrestors

a. Shall be provided by Division 27 10 00

b. Protect all exterior or interior devices, control, power, signal cables and conductors that are power surges. Each surge protector shall be UL Listed.

c. Unless otherwise noted, surge protection devices shall be installed at both the edge and head end of the cabling run.

d. Surge devices shall be installed as close as accessibly possible to the equipment they are protecting.

e. Surge Protection shall be properly installed in an accessible ceiling or enclosure space to allow for cable removal during troubleshooting.

f. Include surge protection device locations on as-builts and shop drawings.

g. Provide protection against spikes, surges, noise, and other line problems for all system equipment and components.

h. Properly ground surge protection devices per the manufacturer installation requirements.

H. Video Surveillance Cabling

1. Unless otherwise noted, all data cabling from end to end to support the Video Surveillance System and all related IP devices shall be provided, installed, and maintained by Div. 27 10 00/ the Owner.

a. Alternative communications means and methods shall be provided by Division 27/28 where applicable, including but not limited to:

1) PoE over Fiber

I. Device Labeling

1. Unless otherwise, all installed devices shall be labeled. Contractor shall verify device numbering scheme and Owner's current naming convention standard in writing in advance via RFI prior to generating any labels.

2. Unless otherwise stated, all labels shall be machine printed and adhered to the device in a location that is visible and legible to the naked eye.

3. All labeling in the field shall match the same labeling scheme in the closeout documents.

4. Refer to Div. 27 specifications for data network device cabling requirements.

J. Grounding and Bonding

1. All grounding and bonding shall be performed by a licensed electrical contractor to ensure the electrical integrity of the low voltage system and devices specified herein per federal / state / local codes and standards.

2. Contractor shall notify the Architect / Owner / Design Consultant via written RFI of any site conditions or installations that will require additional coordination.

3. Contractor shall ensure proper grounding of shielded or non-shielded cabling and devices conform to the specified devices manufacturer's installation guidelines.

4. The Division 28 Contractor is responsible for coordinating with the Division 26 Contractor for grounding and bonding security devices per applicable codes and standards.

K. Conduit, Boxes and Raceways (For Reference Only - By Division 26)

1. Install all conduit necessary for a complete installation but not limited to: in finished areas, in concealed areas, in chases, in furring's, in concrete slabs and/or above suspended ceilings. No exposed conduit shall be installed within public areas.

2. Conduit shall be carefully installed, properly and adequately supported as required to comply with the requirements outlined herein and as required by the NEC to provide a neat, industry-standard installation. Horizontal conduit runs shall be supported by clamps, pipe straps, special brackets, or heavy iron tie, tied to the black iron structural members supporting the ceiling. Fastening of conduit to masonry walls, floor or partitions require malleable pipe clips with screws and suitable expansion sleeves.

3. All conduits shall be cut accurately to measurements established at the building and shall be installed without springing or forcing.

4. All required inserts shall be drilled-in and all openings required through concrete or masonry shall be saw cut or core drilled with tools specifically designed for this purpose.

5. Swab out and remove all burrs from conduit before any wires are pulled.

6. Lay out and install conduit runs as to avoid proximity to hot pipes. In no case shall a conduit be run within 75 mm of such pipes, except where crossings are unavoidable and then the conduit shall be kept at least 25 mm from the covering of the pipe crossed.

7. Provide fire stops where conduits penetrate fire rated walls and/or floors.

8. All conduit installation, whether run exposed or concealed, shall be approved prior to installation by the Architect.

3.5 TESTING REQUIREMENTS

A. The Contractor shall perform a burn-in of the system that is in accordance with the manufacturer's installation guidelines.

1. All devices shall be powered up and tested in a phased approach in a controlled testing environment on or off premise (to be coordinated with the Owner).

2. Update firmware with most up to date version (to be coordinated with the Owner).

B. Contractor shall conduct a five (5) day burn in test. Each system hardware device shall remain operational during the burn-in test for a minimum of eight (8) hours without failure.

1. Contractor shall provide successful burn-in results in writing to the Architect / Design Consultant prior to final acceptance.

C. Security Contractor shall conduct a complete QA/QC test of the entire system and provide a written report of the test results (Punchlist). The tests shall include, but not limited to:

1. Hardware

2. Software

3. Network Connectivity

4. Device Power

5. Configure system device settings

6. Setting camera views (aim & focus)

7. Archiving of video footage

D. It is the responsibility of the Contractor to verify that all devices, equipment, software, interfaces, sub-system interfaces and integrations are fully functional and operational.

E. Contractor shall rectify all issues discovered during the QA/QC process and shall document these corrections via a Contractor provided punch-list.

1. At a minimum, the punch-list shall contain:

a. Date of the item identified

b. Description of the discrepancy with photographs, as necessary.

c. Date the item was rectified

F. All QA/QC items shall be corrected, and an electronic report surrendered to the Architect / Design Consultant prior to calling for Substantial Completion.

3.6 TRAINING REQUIREMENTS

A. Training outline with Owner sign off specific to the vertical market served.

B. Provide for (4) hours of training for two (2) persons on each system.

C. The Contractor shall closely coordinate with the Owner to establish a training syllabus and schedule. Submit a comprehensive training curriculum to the Owner once all preliminary coordination is complete. The Owner will revise and comment on the curriculum as required.

D. Contractor training shall be conducted onsite/virtually. Training shall be conducted by a Factory Certified trainer from the Manufacturer.

E. Operator training shall be structured to provide the appropriate users the information required for them to be able to perform the following tasks:

1. All operating procedures

2. System configuration

3. Camera Configuration

4. Rules Configuration

5. Alarm acknowledgement, alarm response logging, and map graphics functionality
6. Manipulation of cameras and presets.
7. Archiving Recorded Video

F. Administrative training shall include, but not be limited to the following:

1. All operating system procedures, configuration variables and graphic user interface (GUI)
2. Report generation

G. Record, label, and catalog all training on DVD and “user’s manual” written specifically for the Owner personnel onsite, for daily routine operations of the systems. Provide the DVD and user’s manual to the Owner for future in-house training sessions and / or reviews. Furnish all temporary equipment necessary for recording all training sessions. Maintain accurate and up-to-date time sheets of all training sessions.

H. The Owner reserves the right to use any excess training hours, not used by the time of system completion, for future training as requested until the total number of training hours has been completed.

3.7 FIELD OBSERVATIONS

A. A minimum of ten business days in advance, Contractor shall notify the Design Consultant and Owner as to the readiness for a Field Observation for the following at a minimum but not limited to:

1. Rough-In Observation – after conduits have been installed, but before walls have been installed.
2. Above Ceiling Observation – after cabling has been installed, but before ceilings have been installed.
3. Final Site Observation – a minimum of two weeks before Substantial Completion.

B. During Design Consultant’s Final Site Observation of the installed systems, provide a minimum of one factory-trained/certified technician on the operation of all installed systems for up to (1) 8-hour day to assist with Design Consultant’s functional testing.

C. Non-Conforming Work (Punch-List)

1. After receipt of written notice of deficiencies (Punch-List), Contractor shall correct all defective work within ten business days. If the work has been identified to be corrected by the Architect/Design Consultant, the Contractor shall remediate it in conformance with the contract documents at no cost to the Owner.

3.8 SUBSTANTIAL COMPLETION

A. It is the responsibility of the Contractor to ensure that all punch list items are 100% complete. The Contractor shall complete an internal Quality Assurance / Quality Control inspection, make all corrections, document the deficiencies and corrections prior to requesting for any further inspections with the Architect / Owner / Design Consultant.

B. Prior to any Substantial Completion, the Contractor shall submit a minimum two sets of preliminary (first draft) Record Drawings (As-Builts) to the Architect/Design Consultant. The preliminary Record Drawings are to be used by the Architect/Design Consultant to conduct the system substantial completion inspection.

C. The Contractor shall notify the General Contractor / Architect / Design Consultant that all the items noted above have been completed and the installation is ready for inspection.

D. The Architect / Design Consultant shall schedule an inspection of the installation with the General Contractor and the Installing Contractor(s) present.

E. The Substantial Completion Inspection shall consist of the following:

1. The Project Manager/Superintendent and Installation Technician shall be on site with all tools, materials, and equipment ready to resolve any minor issues identified.
2. The Design Consultant or designated representative shall visually inspect the installation in accordance with the official design documents.

a. The Contractor shall be prepared to remove and reinstall (minimum 10%) randomly selected security devices to inspect the mounting, cabling, terminations, connectors, labeling, tampers.

3. Punch list items shall be identified and documented in a provided punch list with a date and description of the issue found, and a date the discrepancy was addressed and the resolution.

F. Provide all personnel, equipment, and supplies necessary to perform all site testing. All video surveillance cameras shall be pointed and aimed in the views as shown in the drawings and using best practices. Contractor shall provide a minimum two employees to verify all cameras have been pointed and aimed to achieve Owner final approval. A manufacturer's representative may be present on site to answer any questions that may be beyond the technical capability of the Contractor's employees, if the Contractor so elects or by specific request of the Architect or Owner, at no charge to the Architect or Owner.

G. The Contractor shall coordinate with the Architect/Design Consultant on security related construction clean-up and patch work requirements. Security equipment closets and similar areas should be free of accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, remove all waste materials, rubbish, the Contractor's and its subcontractors' tools, construction equipment, machinery, and all surplus materials.

H. At their discretion, if the Design Consultant or their designated representative deems the site not ready for inspection/observation, the inspection will be cancelled. The Contractor(s) shall immediately address all issues identified, and shall reschedule the inspection in a timely manner so as not to affect the overall construction schedule.

I. Adjustments and Documentation: energizing and testing the systems, make adjustments and document the setting of controls, configurations, as applicable. Tabulate all data along with an inventory of test equipment, a description of testing conditions and a list of test personnel.

J. Test Documentation: Create and provide complete test reports documenting the results of the each performed on each device, control panel, power supply, and other elements of the system. Copies of preliminary test data shall accompany copies of performance testing data as part of the Operating and Maintenance submittal.

3.9 PROJECT CLOSEOUT DOCUMENTATION

A. As-Built Drawings

1. Drawings shall be provided to the Architect / Owner / Design Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Architect / Owner / Design Consultant.

2. Unless otherwise requested, Contractor shall provide digital copies of close-out documents, and deliver to the Architect / Owner / Design Consultant electronically.

3. As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.

4. Drawings shall be provided in the original size as issued by the Architect/Design Consultant.

5. Drawings shall retain the formatting and title block of the original drawings as issued by the Architect/Design Consultant.

6. Provide a conformed set of Drawings as related to the project, depicting the condition of the Video Surveillance system as installed to include but not limited to:

a. ASI, PR, and Addendum items installed throughout the duration of the project.

7. Provide a hard copy of the conformed set of drawings to be physically stored at the end of the project in a designated Video Surveillance System enclosure. Coordinate with Owner for final storage location.

8. Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of the following not limited to:

a. Video Surveillance System Riser / Signal Flow Diagrams

b. Video Surveillance System Backboard Layouts

1) To include Video Surveillance boards, power supplies, pathways, etc.

c. Sleeves, Backbone Cabling and Communication pathways

d. Video Surveillance System device locations and labeling scheme.

9. **As-builts shall include each MAC Address clearly labeled next to each IP device it's associated with, IE. each camera and intelligent controller.**

B. Operation & Maintenance Manuals

1. Unless otherwise noted, provide O&M manuals electronically to Owner to include all drawings, product datasheets, hardware manuals as related to the project.

2. Coordinate with the Owner for provisioning of physical storage devices (Hardcopy, Flash Drive, CD/DVDs)

C. Manufacturer's Product Warranty

1. Certificate of product warranty shall be provided to the Architect / Owner / Design Consultant at the time of final system acceptance. Final payment will not be recommended until this certificate of product warranty is received and approved by the Architect/Design Consultant.

2. The manufacturer of the solution shall furnish a product warranty as per the specifications starting at final system acceptance.

3. One original and two copies of the Manufacturer's product warranty shall be provided.

D. Contactor's Statement of Warranty

1. Statement of warranty shall be provided to the Architect/Design Consultant at the time of substantial completion. Final payment will not be recommended until statement of warranty is received and approved by the Architect/Design Consultant.

2. Contractor shall furnish a minimum of a one (1) year warranty on all materials, labor and workmanship starting at final system acceptance.

3. One original and two copies of Contractor's warranty terms and conditions to include contact information (i.e., Contractor name, Point of Contact, address, phone number and email address) and start and end date for warranty call outs.

END OF SECTION 282300

SECTION 28 46 00 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SUMMARY

A Design and Provide a complete new fire alarm system for the _____ facility.
1. Protected premises shall consist of main building and all outbuildings where fire alarm coverage is required.

B Fire alarm system shall incorporate Emergency Voice Alarm and Communication System (EVACS) style notification.

C Section Includes:
1. Fire Alarm System Delegated Design
2. Fire Alarm System Installation, including all components, wiring, and conduit.
3. Transmitters for communication with supervising station.
4. Maintenance of fire alarm system under contract for specified warranty period.

1.2 DEFINITIONS

A AHJ: Authority (or Authorities) Having Jurisdiction.

B EMT: Electrical Metallic Tubing, a type of electrical conduit as defined in NFPA 70 article 358.

C EVACS: Emergency Voice Alarm Communication System as defined in NFPA 72, also known as "Voice Evacuation".

D FAA: Fire Alarm System Annunciator

E FACP: Fire Alarm Control Panel

F FPP: Licensed Fire Alarm Planning Professional.

G HVAC: Heating, Ventilating, and Air-Conditioning

H NICET: National Institute for Certification in Engineering Technologies

I UON: Unless Otherwise Noted

1.3 REFERENCE STANDARDS

Standards referenced below shall be current edition including all revisions, UON.

A 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

D NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

G NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

H NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I UL 268 - Standard for Smoke Detectors for Fire Alarm Systems; Current Edition, Including All Revisions.

J UL 268A - Standard for Smoke Detectors for Duct Application; Current Edition, Including All Revisions.

K UL 521 - Standard for Heat Detectors for Fire Protective Signaling Systems; Current Edition, Including All Revisions.

L UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.

M UL 1480 - Standard for Speakers for Fire Alarm and Signaling Systems, Including Accessories; Current Edition, Including All Revisions.

N UL 1971 - Standard for Signaling Devices for the Hearing Impaired; Current Edition, Including All Revisions.

1.4 ACTION SUBMITTALS

A Delegated Design Submittal: Contractor shall perform all planning, calculations, etc. necessary for a complete fire alarm design, and prepare and submit to Authority Having Jurisdiction all documentation required for plan review and permitting, including but not limited to floor plans, riser diagrams, and description of operation.

B Qualifications and Product Data:
1. Copy (if any) of list of data required by authority having jurisdiction.
2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
3. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
4. Evidence of designer qualifications.
5. Evidence of installer qualifications.
6. Evidence of instructor qualifications; training lesson plan outline.
7. Evidence of maintenance contractor qualifications, if different from installer.

C Shop Drawings and Design Calculations:
1. Shop drawing submittal shall be approved by AHJ prior to submission to Architect & Engineer.
2. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
3. System zone boundaries and interfaces to fire safety systems.
4. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
5. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
6. List of all devices on each signaling line circuit, with spare capacity indicated.
7. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.

1.5 CLOSEOUT SUBMITTALS

A Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test Form," filled out.

B Operating and Maintenance Data: See Section 01 78 00 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.

4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

C Project Record Documents: Have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

D Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
3. Maintenance contract.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
1. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
2. In addition to the items in quantities indicated in PART 2, furnish the following:
   a. All tools, software, and documentation necessary to modify the fire alarm system using Owner's personnel; minimum modification capability to include addition and deletion of devices, circuits, and zones, and changes to system description, operation, and evacuation and instructional messages.
   b. One copy, on USB Flash Media, of all software not resident in read-only-memory.
   c. Spare Lamps for Remote Indicating Lamp units: One unit, or 5% of the quantity of remote indicating lamp units installed, whichever is greater.
   d. Spare Lamps for Strobe Units: One unit, or 5% of the quantity of strobes and horn strobes installed, whichever is greater.
   e. Extra Fuses: Two for each size of installed fuse; Provide in a box or cabinet with compartments marked with fuse types and sizes.

1.7 QUALITY ASSURANCE

A Designer (Fire Alarm Planning Professional) Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by installing Contractor.

B Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

C Maintenance Contractor Qualifications: Same entity as installer.

D Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.8 PROJECT CONDITIONS

A Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

B Coordinate the work of this section with the work of other sections, including sprinkler systems, elevators, HVAC systems, and security/door locking systems.

1.9 WARRANTY

A Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

B Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A Fire Alarm Control Units and Accessories:
1. Carrier Fire & Security Solutions/Edwards; _____: https://www.edwardsfiresafety.com/en/us/
2. Carrier Fire & Security Solutions/Kidde; _____: https://www.kidde-fenwal.com/Public/Kidde#
3. Honeywell Security & Fire Solutions/Gamewell-FCI; _____: www.gamewell-fci.com/#sle.
4. Honeywell Security & Fire Solutions/Fire-Lite; _____: www.firelite.com/#sle.
5. Honeywell Security & Fire Solutions/Notifier; _____: www.notifier.com/#sle.
6. Honeywell Security & Fire Solutions/Silent Knight; _____: www.silentknight.com/#sle.
7. Potter Electric Signal Company; _____: www.pottersignal.com/#sle.
8. Siemens Building Technologies, Inc; _____: www.usa.siemens.com/#sle.

B Initiating Devices and Notification Appliances:
1. Carrier Fire & Security Solutions/Edwards; _____: https://www.edwardsfiresafety.com/en/us/
2. Carrier Fire & Security Solutions/Kidde; _____: https://www.kidde-fenwal.com/Public/Kidde#
3. Honeywell Security & Fire Solutions/Gamewell-FCI; _____: www.gamewell-fci.com/#sle.
4. Honeywell Security & Fire Solutions/Fire-Lite; _____: www.firelite.com/#sle.
5. Honeywell Security & Fire Solutions/Notifier; _____: www.notifier.com/#sle.
6. Honeywell Security & Fire Solutions/Silent Knight; _____: www.silentknight.com/#sle.
7. Honeywell Security & Fire Solutions/System Sensor; _____: https://buildings.honeywell.com/us/en/brands/our-brands/system-sensor
8. Siemens Building Technologies, Inc; _____: www.sbt.siemens.com/#sle.
9. Same manufacturer as control units.

2.2 FIRE ALARM SYSTEM

A Fire Alarm System: Provide a new automatic fire detection and alarm system:
1. Provide all components necessary for a fully operational system in accordance with AHJ-approved design, applicable prescriptive codes, and design notes on contract drawings.
2. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
   a. ADA Standards.
   b. The requirements of the local authority having jurisdiction , which is _____.
   c. Applicable local codes.
   d. Contract Documents (drawings and specifications).
   e. NFPA 101.

f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.

3. Evacuation Alarm: Single smoke zone per building ; general evacuation of entire affected building.
   a. System shall be programmed such that each independent building on campus alarms and evacuates separately, to the extent permitted by code and AHJ.
4. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
5. Program notification zones and voice messages as directed by AHJ.
6. Fire Alarm Control Unit: New, located at _____.

B Supervising Stations and Fire Department Connections:
1. Public Fire Department Notification: By remote supervising station.
2. Remote Supervising Station: UL-listed central station under contract to facility.
3. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), VoIP with Cellular Backup.

C Circuits:
1. Initiating Device Circuits (IDC): Class B.
2. Signaling Line Circuits (SLC): Class B.
3. Notification Appliance Circuits (NAC): Class B.
4. Pathway Survivability: Level 0.

D Spare Capacity:
1. Notification Appliance Circuits: Minimum 25 percent spare capacity.
2. Speaker Amplifiers: Minimum 25 percent spare capacity.
3. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E Power Sources:
1. Primary: Dedicated branch circuits of the facility normal power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.

2.3 FIRE SAFETY SYSTEMS INTERFACES

A Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
1. Sprinkler water control valves.
2. Dry-pipe sprinkler system pressure.
3. Dry-pipe sprinkler valve room low temperature.
4. Elevator shut-down control circuits.

B Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Sprinkler water flow.
2. Kitchen hood suppression activation; also disconnect fuel source from cooking equipment.
3. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.

C Elevators:
1. Elevator lobby, hoistway, and machine room smoke detectors: Elevator recall for fire fighters' service.
2. Elevator Machine Room Heat Detector: Shut down elevator power prior to hoistway sprinkler activation.
3. Sprinkler pressure or waterflow: Shut down elevator power prior to hoistway sprinkler activation.

D HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers.
2. Smoke and Fire/Smoke Damper Actuators: Close dampers, shut down air handlers.

E Doors:
1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 08 71 00.
2. Overhead Coiling Fire Doors: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 08 33 23.

2.4 COMPONENTS

A General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B Fire Alarm Control Units: Digital, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C Master Fire Alarm Control Panel (FACP):
1. Field-programmable, microprocessor-based, modular, power-limited design.
2. Software, programs, system database, event history, etc. shall be held in non-volatile system memory to retain information through failure of primary and secondary power supplies.
3. FACP shall include a real-time clock for time annotation of events.
4. FACP shall provide a minimum 500-event history log.
5. Complying with UL 864.
6. Display: Graphical LCD type.
7. Digital Alarm Communicator Transmitter (DACT):
   a. DACT shall be acceptable to the remote central station and comply with UL 632.
   b. Communicator shall monitor communication line status, conduct automatic self-tests and initiate a System Trouble signal if service is lost.
   c. Communicator shall provide local annunciation and display capabilities for local testing and troubleshooting.
   d. Secondary Power: Communicator shall be provided with integral rechargeable battery and automatic charger.
8. Network Communications:
   a. Provide network communications and accessories as needed for fire alarm system IP communication to central station according to fire alarm manufacturer's written requirements.
   b. Provide inegration gateway using BACnet for connection to building automation system.
9. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.
   a. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
10. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
    a. Batteries: Sealed lead calcium.
    b. Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 24 hours with 15 minutes of alarm signaling at end of this 24-hour period, as required by NFPA 72, Local Systems.

D Remote Annunciator(s): at _____.
1. Display and user interface located remotely from main control panel.
2. Signals annunciated and functions available at annunciator shall match those of FACP for alarm, including alarm / supervisory / trouble indications, acknowledging, silencing, resetting, and testing.

3. Each annunciator shall be provided with a remote microphone for EVACS ana

E Addressable Modules:
1. Provide addressable modules suitable for connection to fire alarm control unit signaling line circuits.
2. Unless otherwise indicated, use addressable modules only in clean, dry, indoor, nonhazardous locations.
3. Monitor Modules: Unless devices are explicitly permitted to be connected together as zone, provide separate addressable monitor module for each conventional dry-contact input device in order to be individually identifiable by addressable fire alarm control unit.
4. Releasing Control Modules: Provide as indicated or as required for control of listed solenoids in releasing applications.
5. Relay Modules: Provide as indicated or as required to perform necessary functions via dry-contact interface. Where load exceeds module contact rating, provide accessory power isolation relays suitable for load as required.
6. Signaling Line Circuit (SLC) Isolating Modules: Provide as indicated or as required to automatically isolate short circuits on connected sections of SLC loops and allow other sections to continue to function normally. Provide automatic reset upon correction of short circuit.

F Initiating Devices:
1. Addressable Systems:
   a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
   b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
2. Manual Pull Stations: Only at attended locations as indicated on drawings.
   a. Spares: Provide 1 extra.
   b. Pull Station Local Alarm Cover: At each pull station, provide a factory-fabricated clear plastic cover with top hinge and integral, battery-powered local alarm. Lifting cover actuates alarm to discourage false-alarm operation of pull station. Safety Technology International #Stopper II series or equal.
3. Smoke Detectors & Detector Bases: In each storage room, covering paths of egress, and all other locations required per prescriptive code. Refer to prescriptive codes referenced for detailed requirements.
   a. Detectors shall be twist-lock mounted to a fixed base wiring module, allowing replacement of detector without disturbing permanent wiring.
   b. Comply with UL 268.
   c. Spares: Provide 1 spare or 5% of quantity installed, whichever is greater.
4. Duct Smoke Detectors: At air handling equipment > 2000 CFM as required by code.
   a. Detectors shall be twist-lock mounted to a fixed base wiring module and sampling enclosure, allowing replacement of detector without disturbing permanent wiring.
   b. Weatherproof Duct Housing Enclosure: NEMA EN 10250, type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC ducts.
   c. Sampling Tubes: Design as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
   d. Relay Fan Shutdown: Programmable relay rated to interrupt fan motor control unit.
   e. Comply with UL 268A.
   f. Spares: Provide 1 extra.
5. Heat Detectors & Detector Bases: In kitchens, break rooms, and other locations where fire detection is required but smoke detection is subject to a high probability of false alarms. See prescriptive codes referenced for detailed requirements.
   a. Detectors shall be combination-type, programmable to actuate by either fixed temperature or rate-of-rise unless otherwise indicated.
   b. Detectors shall be twist-lock mounted to a fixed base wiring module, allowing replacement of detector without disturbing permanent wiring.
   c. Comply with UL 521.

d. Spares: Provide 1 spare or 5% of quantity installed, whichever is greater.

G Notification Appliances:
1. Bells: At each fire protection sprinkler system entry. See prescriptive codes referenced for detailed requirements..
2. Horn/Strobes: In accordance with applicable prescriptive codes..
   a. Combination device meeting same specifications and requirements as individual devices described below.
   b. Spares: Provide 1 extra.
3. Horns: In accordance with applicable prescriptive codes..
   a. Voice notification appliances complying with UL 1480.
   b. Locate speakers for voice notification to meet the intelligibility requirements of the "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
      1) High-range Units: 2 to 15 W
      2) Low-range Units: 1 to 2 W.
      3) Matching Transformers: Tap range matched to acoustical environment of speaker location.
   c. Spares: Provide 1 extra.
4. Strobes: In accordance with applicable prescriptive codes..
   a. Xenon strobe lights complying with UL 1971.
   b. Rated light output: 15, 30, 75, or 110 cd, selectable in the field.
   c. Where wireguards or other protective covers are used, light output ratings required shall be calculated with guards in place.
   d. Flashing pattern shall be synchronized as prescribed in ADA Standards.
   e. Spares: Provide 1 extra.
5. Provide ceiling-mounted notification appliances except where ceilings are not present or noted on drawings to be free of devices. Refer to architectural plans for ceiling types, heights, and keep-out zones.
6. Provide wireguards in gyms and other areas where devices may be subject to physical damage.

H Door Holders
1. Provide wall- or floor-mounted electromagnetic type hold-opens complete with matching doorplates as indicated on technology and/or architectural drawings and specifications.
2. Units shall require no more than 3 W to develop 25-lbf holding force.
3. Material and finish: match door hardware.

I Remote Power Supply Units for Peripherals
1. Where required by the fire alarm system manufacturer, remote power supplies shall be provided that will provide sufficient current to drive audio/visual or other required devices.
2. These units shall be located in electrical closets, mechanical rooms or similar spaces. They shall not be installed in finished areas, storage rooms, etc., without the permission of the Engineer. All locations shall be indicated on the shop drawing submissions.
3. Remote power supplies shall be provided with local intelligence compatible with the digital multiplex network, so they have a unique address, providing the ability to monitor the supply for loss of power, shorts, grounds an d other supervisory functions.
4. Provide dedicated 120-volt power circuit(s) from nearby panelboards as required, whether indicated on the plans or not.

J Circuit Conductors: Copper or optical fiber; color code and label.
1. Interconnection cabling between buildings shall be optical fiber. No exceptions.
2. Provide plenum cable in environmental air spaces, including plenum ceilings.

K Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

1. Initiating Device Circuits, Notification Appliance Circuits, and Communications Circuits: Provide surge protection at each point where circuit exits or enters a building; rated to protect applicable equipment; for 24 V(dc) maximum dc clamping voltage of 36 V(dc), line-to-ground, and 72 V(dc), line-to-line.

L Locks and Keys: Deliver keys to Owner.

M Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
2. Provide one for each control unit and/or annunciator where operations are to be performed.
3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.1 EXAMINATION

A Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DELIVERY, STORAGE, AND HANDLING

A Delivery: Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B Storage: Store materials in clean, dry area indoors in accordance with manufacturer’s instructions.

C Handling: Protect materials from damage during handling and installation.

3.3 INSTALLATION

A Install in accordance with applicable codes, NFPA 72, NFPA 70, AHJ requirements, and Contract Documents.

B Pathways:
1. Cabling concealed above lay-in & other accessible ceilings and in non-accessible exposed locations may be installed exposed.
   a. Provide plenum-rated cable for exposed cabling pathways routed through environmental air spaces, including plenum ceilings.
   b. For exposed pathways where cabling is 'accessible' (located less than 96 inches above the floor) or otherwise subject to physical damage, cabling shall be installed in EMT.
2. Cabling other than exposed pathways as noted above shall be installed in EMT.
3. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

D Install manual fire-alarm box(es) in the normal path of egress within 60 inches of the exit doorway, between 42 inches and 48 inches above floor level.
1. Provide "Stopper II" (or equal) covers on all manual stations except the manual station installed directly adjacent to the fire alarm control panel.

E Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

F Install framed instructions in a location visible from fire-alarm control unit.

G Grounding:
1. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
2. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.4 PARTIAL SEQUENCES OF OPERATION

A Fire-alarm signal initiation shall be by one or more of the following devices and systems:
1. Manual pull stations.
2. Smoke detectors.
   a. Provide UL-Listed alarm verification feature. Activate an approved "alarm verification" sequence at FACP and detector as prescribed by UL 864.
3. Heat detectors.
4. Automatic sprinkler system water flow.
5. Kitchen Hood fire suppression system.

B Initiation of fire alarm signal shall automatically perform the following actions:
1. Annunciate alarm condition and specific initiating device addressable point at FACP and FAA(s).
2. Sound a distinctive evacuation signal throughout the zone(s) in alarm in accordance with NFPA 72 public mode alarm prescriptive requirements.
3. Activate flashing visual strobe alarm assemblies in accordance with NFPA 72 public mode alarm prescriptive requirements.
4. Transmit alarm message to remote supervising station in accordance with NFPA 72.

C Supervisory signal initiation shall be by one or more of the following devices and actions:
1. Valve supervisory switch(es).
2. Duct smoke detectors.
3. User disabling of zones or individual devices.
4. Loss of communication with any panel on the network.

D Trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
4. Loss of primary power at FACP.
5. Break in standby battery circuitry
6. Failure of battery charging.
7. Abnormal position of any switch at FACP or annunciator.
8. Voice signal amplifier failure.

E Initiation of supervisory or trouble signal shall automatically perform the following actions:
1. Annunciate supervisory or trouble condition and specific addressable point(s) at FACP and FAA(s).
2. Sound a distinctive audio alert at panel and annunciator locations.
3. After a time delay of 200 seconds, transmit a supervisory or trouble signal to remote supervising station in accordance with NFPA 72.

3.5 INSPECTION AND TESTING FOR COMPLETION

A Field tests shall be witnessed by Authority Having Jurisdiction. Notify AHJ and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

B Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

D Provide all tools, software, and supplies required to accomplish inspection and testing.

E Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
1. Visual Inspection: Conduct visual inspection prior to testing.
   a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
   b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

F Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

G Prepare test and inspection reports.

H Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.6 OWNER PERSONNEL INSTRUCTION

A Provide the following instruction to designated Owner personnel:
1. Hands-On Instruction: On-site, using operational system.
2. Classroom Instruction: Contractor furnished classroom, on-site or at other local facility.

B Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
1. Initial Training: 1 session post-occupancy.

C Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
1. Initial Training: 1 session post-occupancy.

D Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.7 MAINTENANCE

A See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B Provide to Owner, at no extra cost, a written maintenance contract for entire manufacturer's warranty period, to include the work described below.

C Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
3. Record keeping required by NFPA 72 and authorities having jurisdiction.

D Provide trouble call-back service upon notification by Owner:
1. Provide on-site response within 2 hours of notification.
2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

F Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

G Comply with Owner's requirements for access to facility and security.

3.8 SOFTWARE SERVICE AGREEMENT

A Comply with UL 864.

B Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

C Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

D Installer shall provide a backup copy of the installed program database on USB drive upon completion of the project. They shall also provide the current version for the panel provided.

END OF SECTION

SECTION 31 00 00

EARTHWORK UNDER BUILDING PAD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Protecting and preserving trees and vegetation to remain.

B. Clearing, stripping, and grubbing of portions of sites which are below the building pads.

C. Stockpiling stripped topsoil in approved locations.

D. Excavating for and otherwise providing stable and compact subgrade below the building pads.

E. Placing and compaction of select fill under improved areas to conform to elevations indicated on the drawings.

F. Filling and finish grading of area around buildings and other improvements using imported topsoil per section 2.1,D.

G. Coordinating Work of other Sections affecting or affected by Work of this Section.

1.2 INSPECTION OF SITE

A. By making a proposal on the Project, the Contractor acknowledges:
1. That the Owner and Architect do not guarantee the accuracy, completeness, or suitability of the contents of the Geotechnical Report or Topographic Survey.
2. That he/she has visited the site to investigate the conditions affecting the Work and has satisfied himself/herself of the character, quality and quantity of surface and subsurface materials or obstacles to be encountered.

B. The Contractor will be required to establish, maintain and be responsible for all reference points, hubs, grades, elevations, lines, and surface measurements. If any discrepancies in the documents are found, the Contractor shall promptly notify the Architect and await instructions before proceeding.

1.3 QUALITY ASSURANCE

A. Inspection and Testing Laboratory Services: Test results shall meet or exceed the standards referenced.

1.4 REFERENCES

A. ASTM International (ASTM)
1. D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3) – Test for Moisture Unit Weight Relations of Soils and Soil Aggregate.
2. D2922, Tests for Density of Soil and Soil Aggregate in place by Nuclear Methods.

1.5 PRE-INSTALLATION CONFERENCE

A. Refer to Section 01 31 13- Project Management and Coordination.

PART 2 - MATERIALS

2.1 MATERIALS

A. Structural Fill: Sandy clay soils free of organic or other deleterious materials, and have a maximum clay lump size of less than three (3) inches. See Construction Documents for Liquid Limit and Plasticity Index per soils report.

B. Earth Fill: Shall be excavated material approved by Architect prior to its use as earth fill around building and landscaped areas, but not under building.

C. Stabilization Materials: Refer to stabilization section(s) in Division 31.

D. Topsoil: Shall be imported, and shall be free from clay, vegetation, debris, stumps, roots, stones larger than 3/4 inch diameter, or other objectionable matter.

PART 3 - EXECUTION

3.1 GENERAL

A. Unknown Utilities and Obstacles:
1. If any unknown or uncharted utilities or objects are encountered during excavation, promptly notify the Architect before proceeding. Arrange with utility and telephone companies for removal and relocation of their equipment, and capping of pipes and wiring as required.

B. Protection of Vegetation:
1. Rope or fence off areas of the site that are designated to remain with vegetation to prevent vehicular traffic and construction damage.
2. Provide wood barricades around trees and shrubs at their drip line in traffic areas to protect them from construction operations until Substantial Completion, or until barricade removal is directed by Architect.
3. Replace damaged trees and vegetation designated to remain with vegetation of equal kind and size. Follow supplier's recommended procedures for planting necessary replacement vegetation.

C. Clearing, Stripping and Grubbing (General):
1. Remove brush, vegetation, debris, and surplus materials from the jobsite. Removal of other remaining impediments as may be necessary to properly execute the scope of this contract shall be included herein. Adhere to State and local code requirements for the disposal of trees and shrubs removed from the site.
2. Do not remove trees or shrubs without the specific approval of the Architect. Vegetation damaged, removed, killed, or constricted from normal growth patterns shall be replaced with a comparable item, or the full replacement amount credited to the Owner.

D. Drainage, Pumping and Grading:
1. Proper drainage of site shall be maintained during construction so that ponding of surface runoff does not occur and cause construction delays and/or inhibit access to the site.
2. Contractor shall control the grading around building so that ground is pitched to prevent water from running into the excavated areas of building or damaging other structures.
3. Provide pumping required to keep excavated spaces clear of water during construction.
4. If any subgrade is damaged due to flooding, damaged area shall be removed and filled with select fill. Placement and compaction of select fill shall meet the requirements for placing and compacting select fill as specified below.
5. If the subgrade, due to any reason or cause, lose the required stability, density, or finish before the foundation structure is placed, it shall be re-compacted and refinished at the sole expense of the Contractor.

3.2 BUILDING FOUNDATION (PAD) PREPARATION

A. Site preparation area at buildings with and without adjacent sidewalks shall extend beyond the limits of the foundation area. See Construction Documents for Site Preparation limits.

B. Existing fill material, top soil vegetation, roots, debris, organic material and other miscellaneous debris shall be removed to a depth of 9 inches and legally disposed of. Actual removal depth may vary and will be determined at time of construction.

C. Over excavate the in-situ soils as required to allow the minimum amount of select structural fill to be placed beneath the slab to achieve the desired elevation. See Construction Documents for amount of select structural fill required per soils report.

D. After stripping, and excavating to the desired grade as indicated above, the exposed soil shall be proof-rolled to locate all soft or loose areas. Soils, which are observed to rut or deflect excessively under the moving load, shall be undercut and replaced with properly compacted structural fill. The proof-rolling and undercutting activities shall be witnessed by a representative of the geotechnical engineer and shall be performed during a period of dry weather.

E. Subsequent to proof-rolling, and just prior to placement of fill, the exposed subgrade within the construction areas shall be evaluated for moisture and density. The subgrade soils shall be at or above the optimum moisture content, and have an in-place dry density of at least 95 percent of the standard effort (ASTM D698)

maximum dry density of the in-situ soils. If the moisture or density does not meet the above criteria, the subgrade shall be scarified to a minimum depth of 6 inches, and moisture adjusted to meet the requirements per the soils report as indicated on the Construction Documents.

F. If remediation is required, Contractor shall have any of the following remediation options:
1. Disking and drying with natural means (if the construction schedule allows).
2. Dry the surface soils by chemically treatment.
3. Remove the unsuitably wet soils and replace the wet soil with select fill having an acceptable moisture content.

The option will be entirely up to the Contractor and no extra will be paid by the Owner.

G. After proof-rolling and undercutting has been completed, and the subgrade tested and adjusted as necessary, fill placement may begin. The first layer of fill shall be placed in a relatively uniform horizontal lift and be adequately keyed into the stripped subgrade soils.

H. Refer to construction drawings for information regarding lime-stablized subgrade treatment.

3.3 FILL PLACEMENT

A. Structural fill materials shall be as specified in Paragraph 2.1, A above. Structural fill shall be placed in maximum lifts of eight (8) inches of loose material and shall have a moisture content as indicated on the Construction Documents. If water must be added, it shall be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Each lift of structural fill shall be tested by a representative of the geotechnical engineer prior to placement of subsequent lifts.

B. Each lift of structural fill shall be compacted as required per the soils report and as indicated on the Construction Documents. Care shall be taken to apply compactive effort throughout the fill and fill scope areas. The moisture content and the degree of compaction of the structural fill soils shall be maintained until the construction of structures above them.

C. Contractor shall be responsible for damage caused to structure because of over excavation or excavations left open during inclement weather. Should the subgrade, for any reason or cause, lose the required stability, density, or finish before the foundation structure is placed, it shall be re-compacted and refinished at the sole expense of the Contractor.

3.4 GRADING

A. Rough Grading: Contractor shall control the grading around building so that ground is pitched to prevent water from running into the excavated areas or damaging other structures. Furnish pumping required to keep excavated spaces clear of water during construction. If a foundation excavation must remain empty through a shut-down period, cover with boards and building paper and clean out immediately when work resumes. If any subgrade should be damaged due to flooding, damaged area shall be removed and filled with select fill.

B. Finish Grading:
1. After rough grading is completed, provide and place imported top soil in the amounts required to bring the rough grade to within two (2) inches of finish grade. This earth fill shall be placed in lifts not to exceed 12 inches after compaction and shall be compacted to a dry density of at least 95 percent of the ASTM D698 maximum dry density.
2. Assure bonding of layers of fill material in compliance with the specifications.
3. Final and fine grading shall be done using a tractor pulled landscape rake and hand raking removing all debris immediately prior to landscaping. The final graded ground surface shall be relatively smooth, free of organic material and in suitable condition to commence landscaping work.

C. Topsoil:
1. Contractor shall furnish all topsoil that may be required to provide finish elevations. Topsoil material shall meet requirements of Paragraph 2.1 of this Section. Spread minimum two (2) inches of topsoil over graded areas after rough grading has been completed.
2. At the completion of finish grading, ground surface shall be relatively smooth, free of organic material and in suitable condition to commence landscaping work.

3.5 INSPECTION AND TESTING LABORATORY SERVICES

A. Refer to Section 01 45 23, Inspection and Testing Laboratory Services for laboratory services to determine the liquid limit, plastic limit and plasticity index for soils and in-place density tests for compacted material.

B. The Contractor shall cooperate with the inspection and testing laboratory in all matters pertaining to the work.

END OF SECTION 31 00 00

SECTION 31 22 13 – SITE GRADING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section pertains to the earthwork generally consisting of excavation, filling, backfilling and subgrade preparation as required for construction of site retaining walls/structures, slab on grade walks, pavement surfaces, landscaped areas and the general shaping of the site as shown, described or reasonably inferred on the drawings.

B. This section excludes work necessary for building pad preparations.

1.02 DEFINITIONS

A. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.

B. Subgrade: The uppermost surface of an excavation, including excavation for trenches, or the top surface of a fill or backfill immediately below base course, pavement, or topsoil materials.

C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

D. Base Course: The layer placed between the subgrade and surface pavement in a paving system.

E. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Owner’s rep. Unauthorized excavation, as well as remedial work directed by the Owner’s Rep shall be at the Contractor's expense.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

G. Unforeseen Excavation: Excavation of material, regardless of its character or nature, below the subgrade elevation required to construct the work as indicated on the drawings or specified herein.

H. Geotechnical Engineer: Person or company contracted by the Owner and/or through the architect to provide testing and onsite Geotechnical services during the construction schedule.

1.03 REGULATORY REQUIREMENTS

A. Contractor shall comply with all current, applicable codes and regulations.

B. Contractor shall comply with all Standard Specifications and Details of Authorities having Jurisdiction for work in the right-of-way or easements.

C. Shoring that is required to complete the Work, is considered a method or technique and is the sole responsibility of the Contractor. If a regulatory agency requires a licensed engineer to design, approve or provide drawings for shoring, then it is the sole responsibility of the Contractor to engage the services of a qualified Engineer for shoring design services at no additional cost to the Owner.

D. Prior to commencement of work, the Contractor shall be responsible for obtaining, at the contractors own expense, all construction permits necessary to complete the project according to the plans and specifications.

1.04 PROJECT CONDITIONS

A. Subsurface data is available from the Owner. Contractor is urged to carefully analyze the site conditions.

B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-preparation operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Prior to earthwork operations, existing utilities, facilities and permanent objects to remain shall be located and adequately protected.

D. Protection of Existing Utilities:
1. Existence and location of underground items are not guaranteed. Investigate and field verify before starting work. Excavation and backfill in the vicinity of existing items of work shall be carried out with extreme caution.
2. Notify Texas 811 or the utility company involved to locate all public and private utility company lines before beginning work.
3. Contractor shall be held responsible for any damage and for maintenance and protection of existing utilities.
4. If unknown and uncharted utilities are encountered during excavation, promptly notify Owner's Representative and the governing utility company when determinable and wait for instructions.
5. For private utilities found, if it is ascertained by Owner's Representative that such utility line has been abandoned, properly cap line at a depth approved by Owner's Representative or remove line as directed. All work to cap and remove abandoned public utilities found, must be coordinated through the governing utility company.
6. If such unknown utilities are encountered and work is continued without contacting the Owner for instructions, and damage is caused to said utilities, Contractor shall repair, at his own expense, such damage to the satisfaction of the Owner and the Utility Company.
7. Indicate on record drawings where there is conflict between field conditions and drawings.

1.05 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

B. Samples: Submit samples of all materials used for Architect's approval wherever specified or as directed by the Architect.

C. Shoring and Slope Protection Design:
1. Prior to beginning any excavation, submit certification to the Architect that the proposed shoring and slope protection system has been accepted and approved by all governing jurisdictions. Certification shall be signed and sealed by the engineer of record for the shoring design.
2. Provide signed letter from the Geotechnical Engineer stating that the proposed design complies with the recommendations of geotechnical reports.

1.06 QUALITY ASSURANCE

A. Pre-Excavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

B. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

C. Testing and Inspection Service: Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soil materials to verify that soils comply with specified requirements and to perform required field and laboratory testing. Contractor responsible to coordinate with the testing agency prior to start of work requiring testing so as to minimize unnecessary cost or delays to the project.

D. Testing:
1. Owner will retain and pay a qualified Geotechnical engineer to take all field samples and do all laboratory testing necessary to verify compliance of the work to these Specifications or as required by

City or other regulatory agencies. The Geotechnical Engineer shall submit results of all testing done during the course of the work to the Owner, Architect, and Contractor.

2. Notify testing lab a minimum of 48 hours in advance of the time testing is required to satisfy requirements of this section.
3. Should testing specified above show work which does not satisfy these Specifications, the Contractor shall pay, through the Owner, for all additional tests required to determine the extent of work that is not satisfactory and for all additional tests necessary to demonstrate compliance with these specifications.
4. All tests shall be performed by the Soil Engineer in accordance with ASTM D 1557, D1556, D2922, D3017, or other test method selected by Geotechnical Engineer.

PART 2 – PRODUCTS

2.01 SOIL MATERIALS

A. Fill materials and sources must be approved by the Owner's Representative. The Contractor is responsible for providing adequate samples and testing results to the Owner for testing and approval.

B. Select fill per 2.2 shall be used beneath all site retaining walls and site structures where fill material is required to achieve the grades and elevations on the plans.

C. General fill per 2.3 shall be used for fill in landscaping areas not supporting structures. Topsoil per 2.4 shall be spread over landscape areas as needed.

D. Fill material beneath paving shall be per 2.2 or 2.3. Regardless of the fill material used, subgrade shall be chemically stabilized for the thickness specified and detailed in the drawings.

E. Material excavated onsite may be used as fills, with prior Geotechnical Engineer approval.
1. Onsite fill materials shall be free of organic or deleterious products.
2. Moisture content of existing soils may require adjustment for compaction approval.

2.02 SELECT FILL

A. The select fill shall consist of sandy clay, lime stabilized clays or clean sand, uniformly graded and free of objectionable material.
1. Sandy Clay Fill: Sandy clay fill shall have a plasticity index between 10 and 20. The fill materials shall be placed in loose lifts not exceeding 8 inches in height and compacted to 95 percent of Standard Maximum Density at the proper moisture content for that soil type as defined by ASTM D 698.
2. Lime Stabilized Clay Fill: Clays may be stabilized in place or mixed with lime at another location on the site and placed and compacted. Lime stabilization shall be performed in accordance with Section 31 32 13.29 – Lime Stabilization or 31 32 13.26 – Lime-Fly Ash or Fly Ash Stabilization. The percent of lime to be used shall be determined by the testing laboratory at the source prior to acceptance of the material for fill. The material shall be placed in loose lifts not exceeding 8 inches in thickness and compacted to 95 percent of Standard Maximum Density at the proper moisture content for that soil type as determined by ASTM D 698.

2.03 GENERAL FILL

A. General fill material shall be used for fill in landscaping areas not supporting structures, and may be used beneath pavement. General fill material may be any native soil free of debris, trash, rocks over one (1) inch in diameter and other objectionable material with a PI less than 35. General fill shall be placed and compacted in lifts not exceeding 8 inches in thickness to 95 percent standard density as defined by ASTM D 698. The fill shall be kept sufficiently low to accommodate the proper depth of topsoil and related sod or other vegetation.

2.04 TOPSOIL

A. Topsoil material shall be native earthen material suitable for growth of vegetation such as silty and sandy loams. The site stripings may be used as topsoil unless otherwise shown on the drawings. Topsoil shall be free of roots and rocks larger than ½ inch (12 mm), subsoil, debris, large weeds and foreign matter. Topsoil

shall be spread over landscape areas to a depth of 4 to 6 inches and compacted to 92 percent of standard density as defined by ASTM D 698.

2.05 SPECIAL DRAINAGE MEDIA

A. All retaining wall and French drain backfill material shall be clean open-graded gravel, maximum 3/4" particle size in accordance with the details contained in the plans

B. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
   1. Grab Tensile Strength: 90 lbf; ASTM D 4632.
   2. Tear Strength: 40 lbf; ASTM D 4533.
   3. Puncture Resistance: 50 lbf; ASTM D 4833.
   4. Water Flow Rate: 150 gpm per sq. ft.; ASTM D 4491.
   5. Apparent Opening Size: No. 50; ASTM D 4751.

C. Approved Materials
   1. Mirafi 140 filter fabric.
   2. Contech C-35NW
   3. Approved alternate.

PART 3 – EXECUTION

3.01 PREPERATION

A. Inspection
   1. Prior to performing the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where work may properly commence.
   2. Verify that survey bench mark and intended elevations for the Work are as indicated.
   3. Verify existing grades and dimensions before starting any grading operations.
   4. Verify that work may proceed in complete accordance with the design.
   5. In the event of discrepancy, immediately notify the Owner's Representative.

B. General

   1. Use all means necessary to control dust on or near the site resulting from the performance of the Work. Thoroughly moisten all surfaces to prevent dust being a nuisance to the public, adjacent uses, and concurrent work on site. Moisture level during compaction operations shall not exceed that amount as specified by Geotechnical Engineer.
   2. Conduct work so as to avoid injury to persons and damage to adjacent property. Provide appropriate shoring, bracing and barriers, including light when necessary.
   3. Coordinate operations with, and provide access to, the Geotechnical Engineer or designated representative during demolition and construction for purposes of testing, investigation and inspection.

C. Protect and maintain benchmarks and survey control points from disturbance during construction.

D. Protect existing site improvements to remain from damage during construction. Restore damaged improvements to their original condition, as acceptable to Owner.

E. Locate and clearly flag trees and vegetation to remain or to be relocated

F. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

G. Protect subgrade from excessive drying or excessive moisture.

3.02 EXCAVATION

A. General - Contractor shall complete all excavation required regardless of the variations in hardness, type, or density of materials encountered, to the dimensions and elevations shown on the drawings. When unsatisfactory material is uncovered, that material shall be removed and replaced with select fill or treated as directed by the Owner's Representative at no additional cost to the Owner.

B. Excavation is unclassified and includes excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
   2. Remedial work due to over-excavation including provision of suitable and stable backfill meeting the degree of compaction required shall be at the Contractor's expense.

C. If excavated materials of a suitable nature are not of sufficient quantity to complete the work, contractor may provide borrow material in sufficient quantity to complete the work with the approval of the Owner's Representative at no additional cost to the Owner.

D. Dispose of excess satisfactory soil material and all unsatisfactory soil material and rock obtained from excavations in at no additional cost to the Owner in accordance with all local Ordinances and State and Federal Laws.

E. Excavation for Pavement
   1. The material exposed after excavation shall be scarified to a depth of 6 inches and compacted to at least 95 percent of Standard (ASTM D 698) Maximum Density within plus or minus 3 percent of optimum moisture content of the soil. Where necessary to achieve the required compaction, stabilization methods as outlined in paragraph 2.2. A. 2 of this specification shall be used at no additional cost to the Owner.
   2. Excavation required beneath pavement sections shall comply with elevations and dimensions shown on the plans and detailed sections within a tolerance of plus or minus 0.10 foot. Contractor shall take care not to disturb areas that are designated to be protected or are outside the construction limits. Excavated areas shall be kept free of ground and surface water.

F. Cut Slopes and Ditches: Slopes and grades of ditches shall conform to the plans within a tolerance of plus or minus 0.10 foot. No exposed slopes shall be steeper than three feet horizontal to one foot vertical. Where slope protection is specified or called out on the plans, said protection shall be placed as soon as practical, after exposing the slope. Erosion and sedimentation controls shall be implemented in all cut areas as specified in Section 01 57 13 – Erosion and Sedimentation Control.

3.03 FILL AND BACKFILL

A. Placement
   1. Fill material shall be placed in loose lifts not exceeding 8 inches for areas beneath site structures and pavement, and 12 inches for landscape areas not supporting structures. Fill areas shall be compacted to 95 percent of Standard Maximum Density at the proper moisture of that soil as defined by ASTM D 698.
   2. Each lift shall be thoroughly compacted and shall have obtained satisfactory density prior to proceeding with the next lift.
   3. The top 6 to 8 inches of material beneath vehicular pavement shall be stabilized after placement.
   4. Material shall be free of trash and rocks over 1 inch in diameter.
   5. Fill shall be brought up to the proper elevations as determined from the lines, grades, sections and elevations shown on the plans.

B. Site Retaining Wall/Structure Backfill:
   1. Place granular material as engineered backfill at all building and site retaining walls.
   2. For precast site retaining walls, install specified gravel and filter fabric prior to backfill installation. Position according to manufacturer's recommendations.
   3. Place in accordance with applicable portions of the Specifications.

4. Compact per approved methods, using hand operated compaction equipment. Compact to at least 90% per ASTM D1557.

C. Compaction and Finishing
1. Suitable compaction equipment commonly used to meet the requirements for this type of compaction work shall be used.
2. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The surface grade shall be consistent with the drainage intent shown on the plans such that no unwanted ponding shall occur.
3. Surface shall not be more than 0.10 feet above or below the established grade, and all ground surfaces shall vary uniformly between indicated grades.
4. Cut material from the site may be used for fill material. Where cut material is used as fill, each lift of such material shall be properly mixed to obtain a uniform material with clay being the predominant material and maintaining a plasticity index less than 35.
   a. Lime stabilization shall be used for clay material and shall conform to Section 31 32 13.19 – Lime Stabilization or 31 32 13.26 – Lime-Fly Ash or Fly Ash Stabilization.
   b. Cement stabilization shall be used for sandy or silty materials and shall conform to Section 31 32 13.16 - Cement Stabilization.

3.04 EROSION CONTROL

A. There shall be at all times adequate protection to newly graded areas to prevent soil erosion as provided in Section 01 57 13 – Erosion and Sedimentation Control.

B. Soil erosion that occurs prior to acceptance of the work shall be repaired at no expense to the Owner.

C. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

D. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Owner's Testing and Inspection Service; reshape and re-compact.

E. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.05 GRADING

A. Rough Grading
1. Cut and fill shall be left sufficiently high to require cutting by fine grading.
2. Grade to subgrade depths required for construction of finished surface materials and for controlled internal drainage of site.

B. Fine Grading
1. Fine grading shall conform to elevations required to ensure finished elevations as indicated on the drawings.
2. At no additional cost to the Owner the Contractor shall be responsible for minor adjustments to finished grade if deemed required by the Owner's Representative.
3. Provide a smooth transition between adjacent existing grades and new grades.
4. Till, disc, hand rake or otherwise scarify soil removing all clods, stones, and undesirable material ½ inch or larger. Place and spread any additional material that may be required.
5. Prepare to immediately begin planting operations of the completed and accepted finish grade to prevent excessive weed growth in lawn areas.

C. Slope grades to direct water away from buildings and to prevent ponding at a minimum of 5% grade for the initial 10 feet, as shown on the drawings or as directed by the Owner's Representative. Maximum cross slope for all walkways shall be 2% for disabled access. Finish subgrades to required elevations within the following tolerances:
   1. Lawn or Unpaved Areas: Plus or minus 0.1 foot (1.2 inches)
   2. Walks: Plus or minus ½ inch
   3. Pavements: Plus or minus ½ inch

3.06 TESTING AND INSPECTION

A. Materials and installed work require testing to show that the specifications for the materials and work have been met. The Owner may, at the Owner's expense, take random tests on materials and installed work. The Contractor shall allow free access to material stockpiles and facilities at all times. In fill areas each lift must be tested and approved before proceeding on the next lift. Retesting of rejected materials and installed work, shall be done at the Contractor's expense.

B. Contractor shall notify Owner's testing laboratory 24 hours in advance of beginning any earth work operations and coordinate testing schedules to meet these specifications.

C. Maximum density tests per ASTM D 698 shall be taken on all fill materials at a rate of one test for each type of soil to be used and at least one test for every 1,000 cubic yards of fill.

D. Field density tests per ASTM D 1556 or ASTM D 2922 shall be taken on all fill material at a rate of one test for every ten thousand 10,000 square feet and at least one test per lift.

E. All imported fill material shall be approved prior to importing.

3.07 DUST ABATEMENT

A. The Contractor shall comply with applicable Federal, State, and local laws and regulations concerning the prevention and control of dust pollution.

B. During the performance of the work required by these specifications or any operations appurtenant thereto, whether on right-of-way provided by the Owner or elsewhere, the Contractor shall furnish all the labor, equipment, materials, and means required, and shall carry out proper and efficient measures wherever and as often as necessary to reduce the dust nuisance, and to prevent dust which has originated from the contractor's operations from damaging crops, orchards, cultivated fields, and dwellings, or causing a nuisance to persons. The Contractor will be held liable for any damage resulting from dust originating from the contractor's operations under these specifications.

C. Dust Control shall be accomplished by one of the following methods:
   1. Sprinkling the ground surface with water until it is moist.
   2. Whenever ordered by the Owner's Representative, the Contractor shall furnish and distribute over the traveled road surfaces, which have not yet been fully restored, an application of Calcium Chloride. The material used shall be Regular Flake Calcium Chloride having a minimum chemical content of Calcium Chloride of 77%. Unless otherwise specified or ordered by the Owner, rate of application shall be 3 pounds per square yard of surface covered.
   3. All methods of reducing formation of dust shall be at no additional cost to the Owner.

3.08 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

B. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

C. Stockpile Topsoil may not exceed 6 feet in height.

3.09 FIELD QUALITY CONTROL

A. Testing shall be the responsibility of the Owner and costs of initial testing shall be paid by Owner. Cost of all subsequent testing necessary due to non-compliance with specifications shall be paid by Contractor.

B. Density Test:
   1. Density tests shall be performed by an approved commercial testing laboratory approved per ASTM D 1557.
   2. Tests shall be performed in accordance with the referenced Standards.
   3. Field and laboratory tests for moisture density relations shall be determined in accordance with ASTM D 1557. The frequency and location of field density tests will be determined by the Geotechnical Engineer.
   4. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Owner.

3.10 DRAINAGE CONTROLS

A. Provide all necessary temporary apparatus, pumps, curbs or ditches as required to divert or convey water from any source away from the Work. Do not allow water from any source to accumulate within or damage earthwork.

3.11 CLEANING AND DISPOSAL

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

B. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property at no additional cost to the Owner.

C. Leave site clean and raked, ready to receive landscaping.

END OF SECTION 31 22 13

SECTION 31 23 33 – TRENCHING BACKFILLING AND COMPACTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for excavating and backfilling for storm sewer, sanitary sewer, water distribution lines, and all related appurtenances. Excavation and backfill shall be in conformance with the locations, lines, elevations and grades shown on the plans. This section also specifies the requirements for clay plugs that must be installed near building face on all utility trenches including water, storm sewer, sanitary sewer, mechanical, electrical, telecom, data, plumbing and other utility trenches for slab on grade and structural first floor building projects.

1.02 DEFINITIONS

A. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.

B. Subgrade: The uppermost surface of an excavation, including excavation for trenches, or the top surface of a fill or backfill immediately below base course, pavement, or topsoil materials.

C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

D. Base Course: The layer placed between the subgrade and surface pavement in a paving system.

E. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Owner’s rep. Unauthorized excavation, as well as remedial work directed by the Owner’s Rep shall be at the Contractor's expense.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

G. Utilities include underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

H. Unforeseen Excavation: Excavation of material, regardless of its character or nature, below the subgrade elevation required to construct the work as indicated on the drawings or specified herein.

I. Bedding Material: Granular material utilized to bed piped utilities placed in trench excavations.

1.03 REGULATORY REQUIREMENTS

A. Contractor shall comply with all current, applicable codes and regulations.

B. Contractor shall comply with all Standard Specifications and Details of Authorities having Jurisdiction for work in the right-of-way or easements.

C. Shoring that is required to complete the Work, is considered a method or technique and is the sole responsibility of the Contractor. If a regulatory agency requires a licensed engineer to design, approve or provide drawings for shoring, then it is the sole responsibility of the Contractor to engage the services of a qualified Engineer for shoring design services at no additional cost to the Owner.

D. Prior to commencement of work, the Contractor shall be responsible for obtaining, at the contractor’s own expense, all construction permits necessary to complete the project according to the plans and specifications.

1.04 PROJECT CONDITIONS

A. Subsurface data is available from the Owner. Contractor is urged to carefully analyze the site conditions.

B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-preparation operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Prior to earthwork operations, existing utilities, facilities and permanent objects to remain shall be located and adequately protected.

D. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by the Authority having Jurisdiction (AHJ) and then only after arranging to provide temporary utility services as required by the AHJ.

E. Protection of Existing Utilities:
   1. Utilities have been located from surveys and available existing records; not all utilities may be shown on the Drawings. Locate all utilities prior to beginning any construction activities.
   2. Notify Texas 811 or the utility company involved to locate all public and private utility company lines before beginning work.
   3. Excavation and backfill in the vicinity of existing items of work shall be carried out with extreme caution. Contractor shall be held responsible for any damage and for maintenance and protection of existing utilities.
   4. If unknown and uncharted utilities are encountered during excavation, promptly notify Owner's Representative and the governing utility company when determinable and wait for instructions.
   5. For private utilities found, if it is ascertained by Owner's Representative that such utility line has been abandoned, properly cap line at a depth approved by Owner's Representative or remove line as directed. All work to cap and remove abandoned public utilities found, must be coordinated through the governing utility company.
   6. If such unknown utilities are encountered and work is continued without contacting the Owner for instructions, and damage is caused to said utilities, Contractor shall repair, at his own expense, such damage to the satisfaction of the Owner and the Utility Company.
   7. Indicate on record drawings where there is conflict between field conditions and drawings.

F. Where utilities require adjustment or relocation to construct the Work, and those utilities are shown on the Drawings, relocation or adjustment is a part of the Work and shall be completed at no additional cost to the Owner.

G. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

1.05 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with classification according to ASTM D 2487 of each soil material proposed for backfill.

C. Samples: Submit samples of all materials used for Owner's Representative's approval wherever specified or as directed.

D. Submit proposed target cement content and production data for sand-cement mixture in accordance with requirements of Paragraph 2.3, Materials Qualifications.

1.06 QUALITY ASSURANCE

A. Pre-Excavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

B. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

C. Testing and Inspection Service: Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soil materials to verify that soils comply with specified requirements and to perform required field and laboratory testing. Contractor responsible to coordinate with the testing agency prior to start of work requiring testing so as to minimize unnecessary cost or delays to the project.

D. Testing:
1. Owner will retain and pay a qualified Geotechnical engineer to take all field samples and do all laboratory testing necessary to verify compliance of the work to these Specifications or as required by City or other regulatory agencies. The Geotechnical Engineer shall submit results of all testing done during the course of the work to the Owner, Architect, and Contractor.
2. Notify testing lab a minimum of 48 hours in advance of the time testing is required to satisfy requirements of this section.
3. Should testing specified above show work which does not satisfy these Specifications, the Contractor shall pay, through the Owner, for all additional tests required to determine the extent of work that is not satisfactory and for all additional tests necessary to demonstrate compliance with these specifications.
4. All tests shall be performed by the Soil Engineer in accordance with ASTM D 1557, D1556, D2922, D3017, or other test method selected by Geotechnical Engineer.

PART 2 – PRODUCTS

2.01 EARTH BACKFILL

A. Earth backfill shall be native soils free of debris, trash, rocks over 1-inch in diameter and other objectionable material.

2.02 CEMENT STABILIZED SAND BACKFILL

A. Use sand-cement mixture producing minimum unconfined compressive strength of 100 pounds per square inch (psi) in 48 hours.
1. Design will be based on strength specimens molded in accordance with ASTM D 558 at moisture content within 3 percent of optimum and within 4 hours of batching.
2. Determine minimum cement content from production data and statistical history. Provide no less than 1.1 sacks of cement per ton of dry sand.

B. Cement: Type I Portland cement conforming to ASTM C 150.

C. Sand: Clean, durable sand meeting grading requirements for fine aggregates of ASTM C 33, or requirements for bank sand below, and the following requirements:
1. Classified as SW, SP, SW-SM, SP-SM, or SM by Unified Soil Classification System of ASTM D 2487.
2. Deleterious materials:
a. Clay lumps, ASTM C 142 - less than 0.5 percent.
b. Lightweight pieces, ASTM C 123; less than 5.0 percent.
c. Organic impurities, ASTM C 40, color no darker than standard color.
3. Plasticity index of 4 or less when tested in accordance with ASTM D 4318.

D. Add required amount of water and mix thoroughly in pugmill-type mixer. This material cannot be used after it loses its moisture content.

2.03 BANK SAND BACKFILL

A. Durable bank run sand classified as SP, SW, or SM by Unified Soil Classification System (ASTM D 2487) meeting following requirements:
1. Less than 15 percent passing number 200 sieve when tested in accordance with ASTM D 1140. Amount of clay lumps or balls may not exceed 2 percent.

2. Material passing number 40 sieve shall meet the following requirements when tested in accordance with ASTM D 4318: PI not exceeding 7.

2.04 WATER

A. Water used for mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter or other substances injurious to the finished product.

B. Water sources other than the local municipal domestic water supply must be approved by the Owner's Representative.

C. If onsite reclaimed water sources are used, tanks and appurtenances must be clearly marked with the words "non-potable" water.

PART 3 – EXECUTION

3.01 PREPERATION

A. Inspection
1. Prior to performing the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where work may properly commence.
2. Verify that survey bench mark and intended elevations for the Work are as indicated.
3. Verify existing grades and dimensions before starting any grading operations.
4. Verify that work may proceed in complete accordance with the design.
5. In the event of discrepancy, immediately notify the Owner's Representative.

B. General
1. Use all means necessary to control dust on or near the site resulting from the performance of the Work. Thoroughly moisten all surfaces to prevent dust being a nuisance to the public, adjacent uses, and concurrent work on site. Moisture level during compaction operations shall not exceed that amount as specified by Geotechnical Engineer.
2. Conduct work so as to avoid injury to persons and damage to adjacent property. Provide appropriate shoring, bracing and barriers, including light when necessary.
3. Coordinate operations with, and provide access to, the Geotechnical Engineer or designated representative during demolition and construction for purposes of testing, investigation and inspection.

C. Protect and maintain benchmarks and survey control points from disturbance during construction.

D. Protect existing site improvements to remain from damage during construction. Restore damaged improvements to their original condition, as acceptable to Owner.

E. Locate and clearly flag trees and vegetation to remain or to be relocated

F. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.02 EXCAVATION

A. General
1. All utility trenches shall be constructed in conformance with OSHA trench safety standards.
2. Sheeting and shoring shall be accomplished to the extent necessary to maintain the sides of the trench in a vertical position throughout the construction period for trenches five (5) feet in depth or deeper. Where approved, trench sides may be laid back in lieu of shoring to meet OSHA safety standards.
3. Utilities shall not be constructed or laid in a trench in the presence of water. All water shall be removed from the trench sufficiently prior to the line placing operation to insure a dry, firm bed on which to place the utility line.

4. Excavation is unclassified and includes excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
   a. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
   b. Remedial work due to over-excavation including provision of suitable and stable backfill meeting the degree of compaction required shall be at the Contractor's expense.
5. If excavated materials of a suitable nature are not of sufficient quantity to complete the work, provide borrow material in sufficient quantity to complete the work at no additional cost to the Owner.
6. Dispose of excess satisfactory soil material and all unsatisfactory soil material and rock obtained from excavations in accordance with the provisions of this Section.
7. Where utilities are in fill, compact fill material to 95% standard proctor maximum dry density at least 12 inches above the top of the proposed utility prior to excavation of trench.
8. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Owner's Representative. Unauthorized excavation, as well as remedial work, shall be at the Contractor's expense.

B. Sewer Trenches
1. For pipe sizes less than 30-inches in diameter, the minimum trench width shall be outside diameter of pipe plus 24-inches.
2. For pipe sizes 30-inches in diameter and larger the minimum trench width shall be outside diameter of pipe plus-36 inches.
3. Trenches shall be excavated to a depth at least 12-inches below the barrel of pipe, and then the pipe bedding and backfill shall be placed as shown on the appropriate details contained within the plans and as described in paragraph 3.3 A. of this section.

C. Excavation for manholes, inlets, tie-in to existing facilities and similar structures shall be sufficient to leave at least 12-inches clear between the outer surfaces and the embankment or sheeting that may be used to hold and protect the banks. Any over depth excavation below such appurtenances shall be refilled with cement stabilized sand, as directed, at no additional cost to the Owner.

D. Water line Trenches:
1. Water lines must be a minimum of 4-feet in depth from the top of proposed grade to the top of pipe, unless otherwise shown on the plans.
2. Trench width for water lines shall be a minimum of the outside pipe diameter plus 24-inches.
3. Trenches shall be excavated to a depth of at least 12-inches below the barrel of pipe, and then the pipe bedding and backfill shall be placed as shown on the appropriate details contained within the plans and as described in paragraph 3.3 B. of this section.

3.03 PIPE BEDDING AND BACKFILL

A. Storm and sanitary sewer trenches:
1. Pipe shall be bedded and backfilled in trench in accordance with the details shown on the plans.
2. Cement stabilized sand bedding shall extend from a point 12 inches below the bottom of the pipe to the level of the spring line. The cement stabilized sand shall be thoroughly rodded after being placed in trench.
3. Bedding, sewer pipe and initial backfill over the top of pipe must be placed in a single day's operation for any given portion of pipe. Initial backfill shall be placed to 12-inches over the top of pipe for cement stabilized sand backfill.
4. Backfill shall be placed in uniform layers not to exceed 8-inch loose depth, and compacted to a minimum of 95 percent of Standard Maximum Density (ASTM D 698) at the proper moisture content specified in the Geotechnical report for this project.
5. Backfill, under pavement and to 2-foot from outer edge, shall be cement stabilized sand up to 1-foot below subgrade elevation.

B. Water line Trenches
1. Pipe shall be bedded and backfilled in trench in accordance with the details shown on the plans.
2. Bank sand bedding shall extend from a point 12-inches below the bottom of the pipe to the level of the spring line. The bank sand shall be thoroughly rodded after being placed in trench.

3. Bedding, sewer pipe and initial backfill over the top of pipe must be placed in a single day's operation for any given portion of pipe. Initial backfill shall be placed to 12-inches over the top of pipe for bank sand backfill.
4. Backfill shall be placed in uniform layers not to exceed 8-inch loose depth, and compacted to a minimum of 95 percent of Standard Maximum Density (ASTM D 698) at the proper moisture content specified in the Geotechnical report for this project.
5. Backfill, under pavement and to 2-foot from outer edge, shall be cement stabilized sand up to 1-foot below subgrade elevation.

C. Bentonite Clay Plug for All Utility Trenches (water, storm, sanitary, mechanical, electrical, telecom, plumping, etc.)
1. All trenches must have a bentonite granular clay plug installed to reduce the transmission of ground water under slab on grade buildings and structural first floor buildings.
a. The plug must be installed at a distance of 1-foot beyond the face of the building foundation and be a minimum of 1-foot wide.
b. The plug must extend 6-inches beneath utility trench into undisturbed soil. This portion of the clay plug must be installed prior to the installation of the utility pipe.
c. The plug must extend across the entire trench width and extend 6-inches into undisturbed soil beyond the trench width. Install bentonite clay plug and the utility pipe at the same time.
d. The plug must extend to within 12-inches of finished grade. A clay plug cap consisting of material with a PI greater than 15 and a LL in excess of 30 shall be placed on top of the bentonite granular clay plug. This clay plug cap shall fill the remaining 12-inches up to finished grade and be placed up to the edge of the building.

3.04 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

B. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

C. Stockpile Topsoil may not exceed 6 feet in height.

3.05 FIELD QUALITY CONTROL

A. Testing shall be the responsibility of the Owner and costs of initial testing shall be paid by Owner. Cost of all subsequent testing necessary due to non-compliance with specifications shall be paid by Contractor.

B. Density Test:
1. Frequency and scope of testing shall be established by Geotechnical Engineer, and as required by local jurisdictional authority. If Geotechnical Engineer has not established a frequency of testing in the Geotechnical Report, testing shall be at every 100 linear foot of trench at a minimum of one per lift and a minimum of one per day.
2. Tests shall be performed in accordance with the referenced Standards.
3. Laboratory tests for moisture density relations shall be determined in accordance with ASTM D 1557. A minimum of one test shall be performed for each major soils type. In addition, sufficient number of retests or check points shall be performed to evaluate accuracy of maximum density values being used.
4. Field in-place density shall be determined in accordance with ASTM Test Methods D 1556 or D 2922, and the moisture-density relations shall be determined in accordance with ASTM Test Method D 1557.
5. Reopen improperly compacted trenches to depth directed, then refill and compact to the specified density at no additional cost to Owner

3.06 DRAINAGE CONTROLS

A. Provide all necessary temporary apparatus, pumps, curbs or ditches as required to divert or convey water from any source away from the Work. Do not allow water from any source to accumulate within or damage trenches.

END OF SECTION 31 22 13

SECTION 31 32 13.19 – LIME STABILIZATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for treating and stabilizing existing subgrade material or select fill material under pavements or site structures as shown on the drawings, by pulverizing, adding lime, and finishing to the lines and grades shown on the drawings and constructed as specified herein.

1.02 DEFINITIONS

A. Subgrade: The uppermost surface of an excavation, including excavation for trenches, or the top surface of a fill or backfill immediately below base course, pavement, or topsoil materials.

B. Backfill: Soil material or controlled low-strength material used to fill an excavation.

C. Base Course: The layer placed between the subgrade and surface pavement in a paving system.

D. Geotechnical Engineer: Person or company contracted by the owner and/or through the architect to provide testing and onsite Geotechnical services during the construction schedule.

E. Moist Cure: Curing soil and lime to obtain optimum hydration.

1.03 REGULATORY REQUIREMENTS

A. Contractor shall comply with all current, applicable codes and regulations.

B. Contractor shall comply with all Standard Specifications and Details of Authorities having Jurisdiction for work in the right-of-way or easements.

C. Prior to commencement of work, the Contractor shall be responsible for obtaining, at the Contractor's own expense, all construction permits necessary to complete the project according to the plans and specifications.

1.04 SUBMITTALS

A. Submit certification that hydrated lime, quicklime, or commercial lime slurry complies with specifications.

B. Submit weight tickets, certified by supplier, with each bulk delivery of lime to work site.

1.05 QUALITY ASSURANCE

A. Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soil materials to verify that soils comply with specified requirements and to perform required field and laboratory testing. Contractor responsible to coordinate with the testing agency prior to start of work requiring testing so as to minimize unnecessary cost or delays to the project.

B. Testing:
1. Owner will retain and pay a qualified Geotechnical engineer to take all field samples and do all laboratory testing necessary to verify compliance of the work to these Specifications or as required by City or other regulatory agencies. The Geotechnical Engineer shall submit results of all testing done during the course of the work to the Owner, Architect, and Contractor.
2. Notify testing lab a minimum of 48 hours in advance of the time testing is required to satisfy requirements of this section.
3. Should testing specified above show work which does not satisfy these Specifications, the Contractor shall pay, through the Owner, for all additional tests required to determine the extent of work that is not satisfactory and for all additional tests necessary to demonstrate compliance with these specifications.
4. All tests shall be performed by the Geotechnical Engineer in accordance with ASTM D 698, D1556, or other test method selected by Geotechnical Engineer.

PART 2 – PRODUCTS

2.01 LIME SLURRY

A. Lime slurry for use in treating the subgrade shall conform to the chemical and physical requirements listed in Tables 1 and 2 of TxDOT Departmental Material Specification (DMS) 6350 for Commercial Lime Slurry. Lime Slurry may be prepared at the job site or other Owner approved location by using Hydrated Lime or Quicklime as specified by chemical and physical requirements in Tables 1 and 2 of TxDOT Departmental Material Specifications (DMS) 6350.

2.02 WATER

A. Water used for mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter or other substances injurious to the finished product.

B. Water sources other than the local municipal domestic water supply must be approved by the Owner's Representative.

C. If onsite reclaimed water sources are used, tanks and apprentices must be clearly marked with the words "non-potable" water.

2.03 SOIL

A. Soil should be a clayey type soil, free of organic material, large rocks and other unsuitable materials with a plasticity index greater than 15 and a liquid limit in excess of 30. The soil should not contain more than twenty percent sands or silts.

B. Where existing pavement or base material is encountered, pulverized or scarify material so that 100 percent of sampled material passes 2-inch sieve.

PART 3 – EXECUTION

3.01 PREPERATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage and displacement.

B. Verify compacted subgrade will support imposed loads.

C. Verify subgrade lines and grades.

D. Complete backfill of utilities prior to stabilization.

E. Cut material to bottom of subgrade using an approved cutting and pulverizing machine meeting following requirements:
   1. Cutters accurately provide smooth surface over entire width of cut to plane of secondary grade.
   2. Provide cut to depth as specified or shown in the Drawings.

F. Alternatively, scarify or excavate to bottom of stabilized subgrade. Remove material or windrow to expose secondary grade. Obtain uniform stability.

G. Correct wet or unstable material below secondary grade by scarifying, adding lime, and compacting as directed by the Owner's Representative, at no additional cost to the Owner.

H. Pulverize existing material so that 100 percent passes a 1-3/4-inch sieve.

3.02 APPLICATION

A. The percent of lime to the dry weight of the soil shall be as shown on the drawings.

B. The lime shall be mixed with water in trucks with approved distributors and applied as a thin water suspension or slurry.

C. Apply slurry with distributor truck equipped with an agitator to keep lime and water in consistent mixture. The distribution of lime shall be uniformly placed in such quantity that all soil to be treated receives the minimum percentage of lime and successive passes made until the proper moisture and lime content is obtained. Limit spreading to an area where preliminary mixing operations can be completed on same working day.

3.03 MIXING

A. Do not expose hydrated lime to open air for 6 hours or more during interval between application and mixing. Avoid excessive hydrated lime loss due to washing or blowing.

B. The material and lime shall be thoroughly mixed by approved road mixers until a homogeneous, friable mixture of material and lime is obtained, free from all clods or lumps.

C. Immediately after the "first mixing" operation, the mixture shall be brought to the proper moisture content and sealed with a light pneumatic rubber tire roller and left to cure for 1 to 4 days, as directed by the Owner's Representative. If rework is required to obtain compaction after 72 hours of the last mixing, add 25% of the specified rate of lime.

D. After curing time add water to bring moisture content of soil mixture to optimum or above. Mix and pulverize until all material passes 13/4-inch sieve; minimum of 85 percent, excluding non-slacking fractions, passes 3/4-inch sieve; and minimum of 60 percent excluding non-slacking fractions passes No. 4 sieve. Test according to TxDOT Tex-101-E, Part III using dry method. All clods shall be reduced in size by raking, blading, disking, harrowing, scarifying or other approved method.

E. Shape mixed subgrade to final lines and grades.

3.04 COMPACTION

A. Compaction of the mixture shall begin immediately after final mixing and in no case later than 3 calendar days after final mixing.

B. Aerate or sprinkle to attain optimum moisture content to 3 percent above optimum, as determined by ASTM D 698 on material sample after final mix with lime.

C. Spread and compact in two or more equal layers where total compacted thickness is greater than equipment manufacturer's recommended range of mixing and compaction.

D. Compact with approved heavy pneumatic or vibrating rollers, or combination of tamping rollers and light pneumatic rollers. Begin compaction at bottom and continue until entire depth is uniformly compacted.

E. Do not allow stabilized subgrade to mix with underlying material. Correct irregularities or weak spots immediately by replacing material and recompacting.

F. Compact subgrade to minimum density of 95 percent of maximum dry density, according to ASTM D 698, at moisture content of optimum to 3 percent above optimum, unless otherwise indicated on Drawings.

G. Seal with approved light pneumatic tired rollers. Prevent surface hair line cracking. Rework and recompact at areas where hairline cracking develops.

3.05 CURING

A. Moist cure for minimum of 3 days before placing base or surface course, or opening to traffic. Subgrade may be opened to traffic after 2 days when adequate strength has been attained to prevent damage. Restrict traffic to light pneumatic rollers or vehicles weighing less than 10 tons.

B. Keep subgrade surface damp by sprinkling. Roll with light pneumatic roller to keep surface knit together.

C. Place base or surface within 14 days after final mixing and compaction. Restart compaction and moisture content of base material when time is exceeded.

3.06 TOLERANCES

A. Surface of the subgrade shall not show any deviation in excess of 1/4 inch above or one inch below established subgrade elevation. Thickness of the finished subgrade shall be at least the thickness shown on the plans within ¼ inch tolerance and can exceed the thickness shown on the plans as needed to meet the needs of the project.

B. The surface shall be uniform and smooth without large clumps or voids.

3.07 FIELD QUALITY CONTROL

A. Testing shall be the responsibility of Owner and costs of initial testing will be paid by Owner. Cost of subsequent testing necessary due to non-compliance with Specifications shall be paid by Contractor.

B. Test soils, lime, and mixtures as follows:
1. Tests and analysis of soil materials will be performed in accordance with ASTM D 4318, using the wet preparation method.
2. Sampling and testing of lime slurry shall be in accordance with TxDOT Tex-600-J, except using a lime slurry cup.
3. Sample mixtures of hydrated lime or quicklime in slurry form will be tested to establish compliance with specifications.
4. Moisture-density relationship will be established on material sampled from roadway, after stabilization with lime and final mixing, in accordance with ASTM 698, Moist Preparation Method.

C. In-place depth will be evaluated for each 5,000-square feet of subgrade and determined in accordance with TxDOT Tex-140-E in hand excavated holes. For each 5,000-square feet of subgrade, 3 phenolphthalein tests will be performed. Average stabilization depth for 5,000-square feet of subgrade will be based on average depth for three tests.

D. Perform compaction testing in accordance with ASTM D 2922. Three tests will be performed for each 5,000-square feet of subgrade.

E. Pulverization analysis will be performed as required by Paragraph 3.03D on material sampled during mixing of each production area. Three tests will be performed per 5,000-square feet of subgrade or a minimum of once daily.

3.08 REWORK OF FAILED SECTIONS

A. Rework sections that do not meet specified thickness.

B. Perform the following steps when more than 72 hours have lapsed since completion of compaction.
1. Moist cure for minimum of 3 days after compaction to required density.
2. Add lime at rate of 25 percent of specified rate at no additional cost to City.
3. Moisture density test of reworked material must be completed by laboratory before field compaction testing can be completed.

3.09 PROTECTION

A. Maintain stabilized subgrade to lines and grades and in good condition until placement of base or surface course. Protect asphalt membrane from being picked up by traffic.

B. Repair defects immediately by replacing material to full depth.

END OF SECTION 31 32 13.19

SECTION 31 32 13.26 – LIME-FLY ASH OR FLY ASH STABILIZATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for treating and stabilizing existing subgrade material or select fill material under pavements or site structures as shown on the drawings, by pulverizing, adding lime and/or fly ash, and finishing to the lines and grades shown on the drawings and constructed as specified herein.

1.02 DEFINITIONS

A. Subgrade: The uppermost surface of an excavation, including excavation for trenches, or the top surface of a fill or backfill immediately below base course, pavement, or topsoil materials.

B. Backfill: Soil material or controlled low-strength material used to fill an excavation.

C. Base Course: The layer placed between the subgrade and surface pavement in a paving system.

D. Geotechnical Engineer: Person or company contracted by the owner and/or through the architect to provide testing and onsite Geotechnical services during the construction schedule.

E. Moist Cure: Curing soil and lime to obtain optimum hydration.

1.03 REGULATORY REQUIREMENTS

A. Contractor shall comply with all current, applicable codes and regulations.

B. Contractor shall comply with all Standard Specifications and Details of Authorities having Jurisdiction for work in the right-of-way or easements.

C. Prior to commencement of work, the Contractor shall be responsible for obtaining, at the Contractor's own expense, all construction permits necessary to complete the project according to the plans and specifications.

1.04 SUBMITTALS

A. Submit certification that fly ash, hydrated lime, quicklime, or commercial lime slurry complies with these specifications.

B. Submit weight tickets, certified by supplier, with each bulk delivery of lime to work site.

1.05 QUALITY ASSURANCE

A. Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soil materials to verify that soils comply with specified requirements and to perform required field and laboratory testing. Contractor responsible to coordinate with the testing agency prior to start of work requiring testing so as to minimize unnecessary cost or delays to the project.

B. Testing:
1. Owner will retain and pay a qualified Geotechnical engineer to take all field samples and do all laboratory testing necessary to verify compliance of the work to these Specifications or as required by City or other regulatory agencies. The Geotechnical Engineer shall submit results of all testing done during the course of the work to the Owner, Architect, and Contractor.
2. Notify testing lab a minimum of 48 hours in advance of the time testing is required to satisfy requirements of this section.
3. Should testing specified above show work which does not satisfy these Specifications, the Contractor shall pay, through the Owner, for all additional tests required to determine the extent of work that is not satisfactory and for all additional tests necessary to demonstrate compliance with these specifications.

4. All tests shall be performed by the Geotechnical Engineer in accordance with Test Method Tex-114-E or other approved methods selected by Geotechnical Engineer.

PART 2 – PRODUCTS

2.01 LIME

A. Lime for use in treating the subgrade shall conform to the chemical and physical requirements listed in Tables 1 and 2 of TxDOT Departmental Material Specification (DMS) 6350 for hydrated lime or quicklime. When Quicklime is selected, the Contractor is to select, prior to construction, the grade to be used and notify the Owner's Representative in writing before changing from one grade to another.

2.02 FLY ASH

A. Fly ash to meet ASTM Specification C618-05, Class C. Fly ash, have a minimum CaO content of 20 percent and contain no lignite ash.

2.03 WATER

A. Water used for mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter or other substances injurious to the finished product.

B. Water sources other than the local municipal domestic water supply must be approved by the Owner's Representative.

C. If onsite reclaimed water sources are used, tanks and apprentices must be clearly marked with the words "non-potable" water.

2.04 SOIL

A. Soil should be a clayey type soil, free of organic material, large rocks and other unsuitable materials with a plasticity index greater than 10 and a liquid limit in excess of 30. The soil should not contain more than twenty percent sands or silts.

B. Where existing pavement or base material is encountered, pulverized or scarify material so that 100 percent of sampled material passes 2-inch sieve.

PART 3 – EXECUTION

3.01 PREPERATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage and displacement.

B. Verify compacted subgrade will support imposed loads.

C. Verify subgrade lines and grades.

D. Complete backfill of utilities prior to stabilization.

E. Cut material to bottom of subgrade using an approved cutting and pulverizing machine meeting following requirements:
   1. Cutters accurately provide smooth surface over entire width of cut to plane of secondary grade.
   2. Provide cut to depth as specified or shown in the Drawings.

F. Alternatively, scarify or excavate to bottom of stabilized subgrade. Remove material or windrow to expose secondary grade. Obtain uniform stability.

G. Correct wet or unstable material below secondary grade by scarifying, adding lime, and compacting as directed by the Owner's Representative, at no additional cost to the Owner.

H. Pulverize existing material so that 100 percent passes a 1-3/4-inch sieve.

3.02 APPLICATION

A. The percent of lime and/or fly ash to the dry weight of the soil shall be as shown on the drawings.

B. The lime and/or fly ash shall be mixed with water in trucks with approved distributors and applied as a thin water suspension or slurry.

C. Apply slurry with distributor truck equipped with an agitator to keep lime and water in consistent mixture. The distribution of lime and/or fly ash shall be uniformly placed in such quantity that all soil to be treated receives the minimum percentage of lime and successive passes made until the proper moisture and lime content is obtained. Limit spreading to an area where preliminary mixing operations can be completed on same working day.

D. Apply lime/fly ash as single mix, single pass.

3.03 MIXING

A. Do not expose hydrated lime and/or fly ash to open air for 6 hours or more during interval between application and mixing. Avoid excessive hydrated lime loss due to washing or blowing.

B. The soil material, lime and/or fly ash shall be thoroughly mixed by approved road mixers until a homogeneous, friable mixture of material, lime and/or sly ash is obtained, free from all clods or lumps.

C. Shape mixed subgrade to final lines and grades.

3.04 COMPACTION

A. Compaction of the mixture shall begin immediately after final mixing and in no case later than 6 hours after final mixing.

B. Aerate or sprinkle to attain optimum moisture content to 3 percent above optimum, as determined by ASTM D 698 on material sample after final mix with lime.

C. Spread and compact in two or more equal layers where total compacted thickness is greater than equipment manufacturer's recommended range of mixing and compaction.

D. Compact with approved heavy pneumatic or vibrating rollers, or combination of tamping rollers and light pneumatic rollers. Begin compaction at bottom and continue until entire depth is uniformly compacted.

E. Do not allow stabilized subgrade to mix with underlying material. Correct irregularities or weak spots immediately by replacing material and recompacting.

F. Compact subgrade to minimum density of 95 percent of maximum dry density, according to ASTM D 698, at moisture content of optimum to 3 percent above optimum, unless otherwise indicated on Drawings.

G. Seal with approved light pneumatic tired rollers. Prevent surface hair line cracking. Rework and recompact at areas where hairline cracking develops.

3.05 CURING

A. Moist cure for minimum of 3 days before placing base or surface course, or opening to traffic. Subgrade may be opened to traffic after 2 days when adequate strength has been attained to prevent damage. Restrict traffic to light pneumatic rollers or vehicles weighing less than 10 tons.

B. Keep subgrade surface damp by sprinkling. Roll with light pneumatic roller to keep surface knit together.

C. Place base or surface within 14 days after final mixing and compaction. Restart compaction and moisture content of base material when time is exceeded.

3.06 TOLERANCES

A. Surface of the subgrade shall not show any deviation in excess of 1/4 inch above or one inch below established subgrade elevation. Thickness of the finished subgrade shall be at least the thickness shown on the plans within1/4 inch tolerance and can exceed the thickness shown on the plans as needed to meet the needs of the project.

B. The surface shall be uniform and smooth without large clumps or voids.

3.07 FIELD QUALITY CONTROL

A. Testing shall be the responsibility of Owner and costs of initial testing will be paid by Owner. Cost of subsequent testing necessary due to non-compliance with Specifications shall be paid by Contractor.

B. Test soils, lime, fly ash and mixtures as follows:
1. Tests and analysis of soil materials will be performed in accordance with ASTM D 4318, using the wet preparation method.
2. Sampling and testing of lime slurry shall be in accordance with TxDOT Tex-600-J, except using a lime slurry cup.
3. Sample mixtures of hydrated lime or quicklime in slurry form will be tested to establish compliance with specifications.
4. Moisture-density relationship will be established on material sampled from roadway, after stabilization with lime and final mixing, in accordance with ASTM 698, Moist Preparation Method.

C. In-place depth will be evaluated for each 25,000-square feet of subgrade and determined in accordance with TxDOT Tex-140-E in hand excavated holes. For each 25,000-square feet of subgrade, 3 phenolphthalein tests will be performed. Average stabilization depth for 25,000-square feet of subgrade will be based on average depth for three tests.

D. Perform compaction testing in accordance with ASTM D 2922. Three tests will be performed for each 25,000-square feet of subgrade.

E. Pulverization analysis will be performed as required by Paragraph 3.03D on material sampled during mixing of each production area. Three tests will be performed per 25,000-square feet of subgrade or a minimum of once daily.

3.08 REWORK OF FAILED SECTIONS

A. Rework sections that do not meet specified thickness.

B. Perform the following steps when more than 72 hours have lapsed since completion of compaction.
1. Moist cure for minimum of 3 days after compaction to required density.
2. Add lime at rate of 25 percent of specified rate at no additional cost to City.
3. Moisture density test of reworked material must be completed by laboratory before field compaction testing can be completed.

3.09 PROTECTION

A. Maintain stabilized subgrade to lines and grades and in good condition until placement of base or surface course. Protect asphalt membrane from being picked up by traffic.

B. Repair defects immediately by replacing material to full depth.

END OF SECTION 31 32 13.26

SECTION 31 41 33 – TRENCH SAFETY

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section is intended to provide specifications for the minimum requirements for trench safety. The Contractor shall endeavor to insure the safety of their employees working in and around trenches and other excavations in accordance with current Occupation and Safety Health Administration (OSHA) standards and in particular, Excavations, Trenching and Shoring, Federal OSHA Standards, 29 C.F.R. part 1926, Subpart P, as amended including Final Rule, published in Federal Register Vol. 54, No. 209 Tuesday October 31, 1989 and latest amendment thereto. These specifications outline minimum standards of construction safety to be followed, but should not be construed as the means, methods and operations of construction. Where the Contractor deviates from these outlined minimum standards, the Contractor is required to submit for approval by the Owner sealed engineering plans designed by a Registered Professional Engineer in the State of Texas showing the proposed method of trench protection. A copy of the approved design shall be kept at the site.

1.02 DEFINITIONS

A. Trench: A narrow excavation (in relation to its depth) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet. The trench safety system requirements will apply to larger open excavations if the erection of structures or other installations limits the space between the excavation slope and these installations to dimensions equivalent of a trench as defined.

B. Trench Safety Systems: Include but are not limited to sloping, sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, shoring, dewatering or diversion of water to provide adequate drainage.

C. Trench Safety Program: The safety procedures governing the presence and activities of individuals working in and around trench excavations.

D. Stable Rock - Natural solid mineral matter that can be excavated with vertical sides and remain in tract while exposed.

E. Type A Soil – Cohesive soils with an unconfined compressive strength of 1.5 tons per square foot or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and in some cases, silty clay loam and sandy clay loam cemented soils such as caliche and hard pan are also considered Type A. However, no soil is Type A if:
   1. The soil is fissured.
   2. The soil is subject to vibration from heavy traffic, piling driving, or similar effects
   3. The soil has been previously disturbed.
   4. The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical or greater.
   5. The soil is subject to other factors that would require it to be classified as a less stable material.

F. Type B Soil – Soil that meets one of the following:
   1. Cohesive soil with an unconfined compressive strength greater than 0.5 tons per square foot, but less than 1.5 tons per square foot.
   2. Granular cohesionless soils including: angular gravel, silt, silt loam, sandy loam and in some cases, silty clay loam and sandy clay loam.
   3. Previously disturbed soils except those which would otherwise be classified as Type C soil.
   4. Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration.
   5. Dry rock that is not stable.
   6. Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical, but only if the soil would otherwise be classified as Type B.

G. Type C Soil – Soil that meets one of the following:
   1. Cohesive soil with an unconfined compressive strength of 0.5 tons per square foot or less.
   2. Granular soils including: gravel, sand and loamy sand.
   3. Saturated or submerged soil.
   4. Submerged rock that is not stable.
   5. Soil in a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical or greater.

H. Unconfined compressible strength shall mean the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, estimated in the field using a pocket penetrometer, or other previously approved methods.

I. Wet soil shall mean soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

1.03 REGULATORY REQUIREMENTS

A. Install and maintain trench safety systems in accordance with current Occupation and Safety Health Administration (OSHA) standards and in particular, Excavations, Trenching and Shoring, Federal OSHA Standards, 29 C.F.R. part 1926, Subpart P, as amended including Final Rule, published in Federal Register Vol. 54, No. 209 Tuesday October 31, 1989 and latest amendment thereto.

B. The Contractor is responsible for obtaining a copy of OSHA standards included in "Subpart P - Excavations" from the Federal Register Vol. 54, No. 209 section of the Federal Register.

C. Legislation that has been enacted by the Texas Legislature with regard to Trench Safety Systems, is hereby incorporated, by reference, into these specifications. Refer to Texas Health and Safety Code Ann., §756.021 (Vernon 1991).

D. Reference materials, if developed for a specific project, will be issued with the Bid/Proposal Documents.

1.04 SUBMITTALS

A. Submit a safety program specifically for the construction of trench excavation. Design the trench safety program to be in accordance with OSHA 29CFR standards governing the presence and activities of individuals working in and around trench excavations.

B. Construction and shop drawings containing deviations from OSHA standards or special designs shall be sealed by a licensed Engineer retained and paid by Contractor.

C. Review of the safety program by the Owner's Representative will only be in regard to compliance with this specification and will not constitute approval by the Owner's Representative nor relieve Contractor of obligations under State and Federal trench safety laws.

D. Submit certification that trench safety system will not be subjected to loads exceeding those which the system was designed to withstand according to the available construction and geotechnical information.

1.05 INDEMNIFICATION

A. Contractor shall indemnify and hold harmless the Owner, its employees and agents, from any and all damages, costs (including, without limitation, legal fees, court costs, and the cost of investigation), judgments or claims by anyone for injury or death of persons resulting from the collapse or failure of trenches constructed under this Contract.

B. Contractor acknowledges and agrees that this indemnity provision provides indemnity for the Owner in case the Owner is negligent either by act or omission in providing for trench safety, including, but not limited to

safety program and design reviews, inspections, failures to issue stop work orders, and the hiring of the Contractor.

PART 2 – PRODUCTS

2.01 GENERAL

A. Materials used for sheeting, sheet piling, cribbing, bracing, shoring, underpinning, and other structural retaining systems shall be in good serviceable condition, of good quality, of a suitable condition and grade to perform the intended use. Wood shall be sound, free from large or loose knots, and of the proper dimensions. The Contractor shall be responsible for maintaining the systems in a manner consistent with the intended design and in a manner that will prevent exposure of workers to hazards.

PART 3 – EXECUTION

3.01 GENERAL SAFETY REQUIREMENTS

A. The work area shall be kept free of hazards to the employees. All surface encumbrances which may create a hazard shall be removed, supported or otherwise isolated as necessary to safeguard employees.

B. The Contractor shall take special precautions to locate existing utilities and to protect those systems as required. The Contractor shall call the Utility Coordinating Committee as required 24 hours prior to excavating around existing utilities.

C. The Contractor shall provide safe access and egress to excavations. Ramps or stairways shall be structurally sound and capable of providing a safe means of escape from the excavation. Trenches in excess of four (4) feet in depth shall have a safe means of egress from the trench spaced such that no more than 25 feet of lateral travel would be required to reach the egress system.

D. The employees shall be protected from work place hazards such as vehicular traffic, falling loads, and hazardous atmosphere. Excavations shall be marked so that employees and equipment are clearly warned of the location of the excavations. Trenches shall be kept free of water accumulations that would present a hazard to employees. Adjacent structures shall be stabilized as necessary so as not to present a possible hazard to the employees. Equipment shall be kept sufficiently clear of excavations so as not to create a potential overburden stress to trench walls causing cave-ins. Safe access shall be provided with handrails where access over trenches is required.

E. Emergency rescue equipment as required by OSHA shall be readily available at the site and shall be maintained to good working condition.

F. Daily inspections of excavations, the adjacent areas, and the protective systems shall be made by a person or persons competent to make such inspections to keep the Contractor notified of unsafe conditions so that necessary precautionary actions can be taken.

3.02 INSTALLATION

A. Install and maintain trench safety systems in accordance with provisions of OSHA 29CFR.

B. Install specially designed trench safety systems in accordance with the Contractor’s trench excavation safety program for the locations and conditions identified in the program.

C. A competent person, as identified in the Contractor’s Trench Safety Program, shall verify that trench boxes and other premanufactured systems are certified for the actual installation conditions.

3.03 INSPECTION

A. Contractor, or Contractor's independently retained consultant, shall make daily inspections of the trench safety systems to ensure that the installed systems and operations meet OSHA 29CFR and other personnel protection regulations requirements.

B. If evidence of possible cave-ins or slides is apparent, Contractor shall immediately stop work in the trench and move personnel to safe locations until the necessary precautions have been taken by Contractor to safeguard personnel entering the trench.

C. Maintain a permanent record of daily inspections.

3.04 FIELD QUALITY CONTROL

A. Contractor shall verify specific applicability of the selected or specially designed trench safety systems to each field condition encountered on the project.

END OF SECTION 31 41 33

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SECTION 31 63 29

DRILLED CONCRETE PIERS AND SHAFTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Dry-installed drilled piers.
   2. Slurry displacement-installed drilled piers.
   3. Dry-installed or slurry displacement-installed drilled piers at Contractor's choice.

1.3 UNIT PRICES

A. Unit prices are included in Section 01 22 00 "Unit Prices."

B. Drilled Piers: Actual net volume of drilled piers in place and approved. Actual length, shaft diameter, and bell diameter if applicable, may vary, to coincide with elevations where satisfactory bearing strata are encountered. These dimensions may also vary with actual bearing value of bearing strata determined by an independent testing and inspecting agency. Adjustments will be made on net variation of total quantities, based on design dimensions for shafts and bells.
   1. Base bids on indicated number of drilled piers and, for each pier, the design length from top elevation to bottom of shaft, extended through the bell, if applicable, and the diameter of shaft and bell.
   2. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete fill, testing and inspecting, and other items for complete drilled-pier installation.

C. Trial Drilled Pier: Unit price as indicated for drilled pier, including backfilling.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Shop Drawings: For concrete reinforcement detailing fabricating, bending, supporting, and placing.

D. Material Certificates: For the following, from manufacturer:
   1. Cementitious materials.
   2. Admixtures.
   3. Steel reinforcement and accessories.

E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

F. Field quality-control reports.

G. Other Informational Submittals:
1. Record drawings.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in drilled-pier work.

B. Testing Agency Qualifications: Qualified according to ASTM C 1077, ASTM D 3740, and ASTM E 329 for testing indicated.

C. Drilled-Pier Standard: Comply with ACI 336.1 unless modified in this Section.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities before excavating drilled piers. If utilities are to remain in place, provide protection from damage during drilled-pier operations.
1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.

B. Interruption of Existing Utilities: Do not interrupt any utility to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
1. Notify all affected parties including Owner no fewer than five (5) days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Owner's written permission.

C. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
1. Make additional test borings and conduct other exploratory operations necessary for drilled piers.
2. The geotechnical report is referenced elsewhere in the Project Manual.

D. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.
1. Record and maintain information pertinent to each drilled pier and cooperate with Owner's testing and inspecting agency to provide data for required reports.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Refer Section 03 20 00.

2.2 CONCRETE MATERIALS

A. Refer Section 03 30 00 and Structural General Notes.

2.3 STEEL CASINGS

A. Steel Pipe Casings: ASTM A 283, Grade C, or ASTM A 36, carbon-steel plate, with joints full-penetration welded according to AWS D1.1.

B. Corrugated-Steel Pipe Casings: ASTM A 929, steel sheet, zinc coated.

2.4 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 limits as if concrete were exposed to deicing chemicals.

C. Proportion normal-weight concrete mixture as follows:
   1. As indicated in Structural General Notes.

2.5 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.6 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled-pier operations.

3.2 EXCAVATION

A. Unclassified Excavation: Excavate to bearing elevations regardless of character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions.
   1. Obstructions: Unclassified excavation may include removal of unanticipated boulders, concrete, masonry, or other subsurface obstructions. No changes in the Contract Sum or the Contract Time will be authorized for removal of obstructions.

2. Obstructions: Unclassified excavated materials may include removal of unanticipated boulders, concrete, masonry, or other subsurface obstructions. Payment for removing obstructions that cannot be removed by conventional augers fitted with soil or rock teeth, drilling buckets, or underreaming tools attached to drilling equipment of size, power, torque, and downthrust necessary for the Work will be according to Contract provisions for changes in the Work.

B. Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.

C. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.
1. Excavate bottom of drilled piers to level plane within 1:12 tolerance.
2. Remove water from excavated shafts before concreting.

D. Notify and allow testing and inspecting agency to test and inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by Architect.
1. Do not excavate shafts deeper than elevations indicated unless approved by Architect.
2. Payment for additional authorized excavation will be according to Contract provisions for changes in the Work.

E. Excavate shafts for closely spaced drilled piers and for drilled piers occurring in fragile or sand strata only after adjacent drilled piers are filled with concrete and allowed to set.

F. Temporary Casings: Install watertight steel casings of sufficient length and thickness to prevent water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls.
1. Remove temporary casings, maintained in plumb position, during concrete placement and before initial set of concrete.

G. Bells: Excavate bells for drilled piers to shape, base thickness, and slope angle indicated. Excavate bottom of bells to level plane and remove loose material before placing concrete.

H. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.
1. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit design and construction proposals to Architect for review before proceeding.

3.3 STEEL REINFORCEMENT

A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.

C. Fabricate and install reinforcing cages symmetrically about axis of shafts in a single unit.

D. Accurately position, support, and secure reinforcement against displacement during concreting. Maintain minimum cover over reinforcement.

E. Use templates to set anchor bolts, leveling plates, and other accessories furnished in work of other Sections. Provide blocking and holding devices to maintain required position during final concrete placement.

F. Protect exposed ends of extended reinforcement, dowels, or anchor bolts from mechanical damage and exposure to weather.

3.4 CONCRETE PLACEMENT

A. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by Owner's independent testing and inspecting agency.
   1. Construct a construction joint if concrete placement is delayed more than one hour. Level top surface of concrete. Before placing remainder of concrete, clean surface laitance, roughen, and slush concrete with commercial bonding agent or with sand-cement grout mixed at ratio of 1:1.

B. Dry Method: Place concrete to fall vertically down the center of drilled pier without striking sides of shaft or steel reinforcement.
   1. Where concrete cannot be directed down shaft without striking reinforcement, place concrete with chutes, tremies, or pumps.
   2. Vibrate top 60 inches of concrete.

C. Coordinate withdrawal of temporary casings with concrete placement to maintain at least a 60-inch head of concrete above bottom of casing.
   1. Vibrate top 60 inches of concrete after withdrawal of temporary casing.

D. Screed concrete at cutoff elevation level and apply scoured, rough finish. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation.

E. Protect concrete work, according to ACI 301, from frost, freezing, or low temperatures that could cause physical damage or reduced strength.
   1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   2. Do not use calcium chloride, salt, or other mineral-containing antifreeze agents or chemical accelerators.

F. If hot-weather conditions exist that would seriously impair quality and strength of concrete, place concrete according to ACI 301 to maintain delivered temperature of concrete at no more than 90 deg F.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Drilled piers.
   2. Excavation.
   3. Concrete.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Drilled-Pier Tests and Inspections: For each drilled pier, before concrete placement.
   1. Soil Testing: Bottom elevations, bearing capacities, and lengths of drilled piers indicated have been estimated from available soil data. Actual elevations and drilled-pier lengths and bearing capacities will be determined by testing and inspecting agency. Final evaluations and approval of data will be determined by Architect.

D. Concrete Tests and Inspections: ASTM C 172 except modified for slump to comply with ASTM C 94.
   1. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no fewer than one test for each concrete load.
   2. Concrete Temperature: ASTM C 1064; 1 test hourly when air temperature is 40 deg F and below and 80 deg F and above, and 1 test for each set of compressive-strength specimens.
   3. Compression Test Specimens: ASTM C 31; one set of four standard 6-inch x 12-inch cylinders for each compressive-strength test unless otherwise indicated. Mold and store cylinders for laboratory-cured test specimens unless field-cured test specimens are required.

4. Compressive-Strength Tests: ASTM C 39; one set for each drilled pier but not more than one set for each truck load. One specimen will be tested at 7 days, 2 specimens will be tested at 28 days, and 1 specimen will be retained in reserve for later testing if required.
5. If frequency of testing will provide fewer than five strength tests for a given class of concrete, testing will be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
6. If strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
8. Report test results in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. List Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests in reports of compressive-strength tests.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests: Testing and inspecting agency will make additional tests of concrete if test results indicate that slump, compressive strengths, or other requirements have not been met, as directed by Architect.
    a. Continuous coring of drilled piers may be required, at Contractor's expense, if temporary casings have not been withdrawn within specified time limits or if observations of placement operations indicate deficient concrete quality, presence of voids, segregation, or other possible defects.
11. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. An excavation, concrete, or a drilled pier will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports for each drilled pier as follows:
1. Actual top and bottom elevations.
2. Actual drilled-pier diameter at top, bottom, and bell.
3. Top of rock elevation.
4. Description of soil materials.
5. Description, location, and dimensions of obstructions.
6. Final top centerline location and deviations from requirements.
7. Variation of shaft from plumb.
8. Shaft excavating method.
9. Design and tested bearing capacity of bottom.
10. Levelness of bottom and adequacy of cleanout.
11. Ground-water conditions and water-infiltration rate, depth, and pumping.
12. Description, purpose, length, wall thickness, diameter, tip, and top and bottom elevations of temporary or permanent casings. Include anchorage and sealing methods used and condition and weather tightness of splices if any.
13. Description of soil or water movement, sidewall stability, loss of ground, and means of control.
14. Bell dimensions and variations from original design.
15. Date and time of starting and completing excavation.
16. Inspection report.
17. Condition of reinforcing steel and splices.
18. Position of reinforcing steel.
19. Concrete placing method, including elevation of consolidation and delays.
20. Elevation of concrete during removal of casings.
21. Locations of construction joints.
22. Concrete volume.

23. Concrete testing results.
24. Remarks, unusual conditions encountered, and deviations from requirements.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 63 29

SECTION 32 13 13 – CONCRETE SITE PAVING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for forming and placing reinforced vehicular pavement, curbs, sidewalks, courtyards and pedestrian areas to the lines and grades shown on the drawings and constructed as specified herein.

1.02 REGULATORY REQUIREMENTS

A. Contractor shall comply with all current, applicable codes and regulations.

B. Contractor shall comply with all Standard Specifications and Details of Authorities having Jurisdiction (herein after referred to as "Standard Specifications") for work in the right-of-way or easements.

C. Prior to commencement of work, the Contractor shall be responsible for obtaining, at the Contractor's own expense, all construction permits necessary to complete the project according to the plans and specifications.

1.03 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Test Reports: From a qualified testing laboratory indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

D. Material Certificates: Signed by manufacturers certifying that each of the following materials which are part of this project, complies with requirements:
   1. Cementitious materials.
   2. Steel reinforcement and reinforcement accessories.
   3. Admixtures.
   4. Curing compounds.
   5. Applied finish materials.
   6. Bonding agent or epoxy adhesive.
   7. Joint fillers.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. Owner will employ a qualified independent geotechnical engineering testing agency to take all field samples and do all laboratory testing necessary to verify compliance of the work to the Specifications or as required by City or other regulatory agencies. Contractor shall be responsible to coordinate with the testing agency prior to start of work requiring testing so as to minimize unnecessary cost or delays to the project.

C. Testing:
   1. The Geotechnical Engineer shall submit results of all testing done during the course of the work to the Owner, Owner's Representative, and Contractor.
   2. Notify testing lab a minimum of 48 hours in advance of the time testing is required to satisfy requirements of this section.

3. Should testing specified above show work which does not satisfy these Specifications, the Contractor shall pay, through the Owner, for all additional tests required to determine the extent of work that is not satisfactory and for all additional tests necessary to demonstrate compliance with these specifications.

PART 2 – PRODUCTS

2.01 CONCRETE MATERIALS

A. Portland Cement:
1. Sample and test cement to verify compliance with Standards of ASTM C 150, Type I or Type III.
2. Bulk cement which meets referenced standards may be used when method of handling is approved by the Owner's Representative. When using bulk cement, provide satisfactory weighing devices.
3. Fly ash which meets standards of ASTM C 618 may be used as mineral fill when method of handling is approved by the Owner's Representative.

B. Water: Conform to requirements for water in ASTM C 94.

C. Coarse Aggregate: Crushed stone, gravel, or combination thereof, which is clean, hard, and durable, conforms to requirements of ASTM C 33, and has abrasion loss not more than 45 percent by weight when subjected to Los Angeles Abrasion Test (ASTM C 131).
1. Maximum percentage by weight of deleterious substances shall not exceed following:

Item	Percent by Weight of Total Sample Maximum
Clay lumps and friable particles	3.0
Material finer than 75-µm (No. 200) sieve:	
Concrete subject to abrasion	3.0*
All Other concrete	5.0*
Coal and lignite:	
Where surface appearance of concrete is of importance	0.5
All other concrete	1.0

* In case of manufactured sand, when material finer than 75-µm (No. 200) sieve consists of dust of fracture, essentially free from clay or shale, these limits may be increased to 5 and 7 percent, respectively.

2. Conform coarse aggregate (size 1 1/2 inch to No. 4 sieve) to requirements of ASTM C 33. Use gradation within following limits when graded in accordance with ASTM C 136:

Sieve Designation (Square Openings)	Percentage by Weight
Retained on 1 3/4" sieve	0
Retained on 1 1/2" sieve	0 – 5
Retained on 3/4" sieve	30 – 65
Retained on 3/8" sieve	70 – 90
Retained on No. 4 sieve	95 – 100
Loss by Decantation Test (Tex-406-A)	1.0 Maximum

* In case of aggregates made primarily from crushing of stone, when material finer than 200 sieve is dust of fracture essentially free from clay or shale as established by Part III of TxDOT Tex-406-A, percent may be increased to 1.5.

D. Fine Aggregate: Sand, manufactured sand, or combination thereof, composed of clean, hard, durable, uncoated grains, free from loams or other injurious foreign matter. Conform fine aggregate for concrete to requirements of ASTM C 33. Use gradation within following limits when graded in accordance with ASTM C 136:

Sieve Designation (Square Openings)	Percentage by Weight
Retained on 3/8" sieve	0
Retained on No. 4 sieve	0 – 5
Retained on No. 8 sieve	0 – 20
Retained on No. 16 sieve	15 – 50
Retained on No. 30 sieve	35 – 75
Retained on No. 50 sieve	65 -90
Retained on No. 100 sieve	90 – 100
Retained on No. 200 sieve	97 – 100

1. When subjected to color test for organic impurities (ASTM C 40), fine aggregate shall not show color darker than standard color. Fine aggregate shall be subjected to Sand Equivalent Test (Tex-203-F). Sand equivalent value shall not be less than 80, unless higher value is shown on Drawings.

E. Mineral Filler: Type “C” or Type “F” fly ash of acceptable quality and meeting requirements of ASTM C 618 may be used as mineral admixture in concrete mixture. When fly ash mineral filler is used, store and inspect in accordance with ASTM C 618. Do not use fly ash in amounts to exceed 20 percent by weight of cementatious material in mix design. Cement content may be reduced when strength requirements can be met. Note: When fly ash is used, term "cement" is defined as cement plus fly ash.

F. Air Entraining Agent: Furnish air entraining agent conforming to requirements of ASTM C 260.

G. Water Reducer: Water reducing admixture conforming to requirements of ASTM C 494 may be used when required to improve workability of concrete. Amount and type of admixture is subject to approval by the Owner’s Representative.

2.02 MIXING

A. Flexural strength shall be as specified using test specimens prepared in accordance with ASTM C 31 and tested in accordance with ASTM C78 (using simple beam with third-point loading). Compressive strength shall be as specified using test specimens prepared in accordance with ASTM C 31 and tested in accordance with ASTM C 39. Determine and measure batch quantity of each ingredient, including water for batch designs and all concrete produced for Work. Mix shall conform to these specifications and other requirements indicated on Drawings.

B. Vehicular Pavement and Curbs
1. Mix design shall have a minimum compressive strength of 3,000 pounds per square inch at 7 days and 3,500 pounds per square inch at 28 days when tested in accordance with ASTM C39. Slump of concrete shall be at least 3 inches but no more than 6 inches, when tested in accordance with ASTM C143.
   a. Determine cement content in accordance with ASTM C 138 (water-cement ratio maximum 0.57). Addition of mineral filler may be used to improve workability or plasticity of concrete to limits specified.
   b. Coarse dry aggregate shall not exceed 85 percent of loose volume of concrete.
   c. Add air-entraining admixture to ensure uniform distribution of agent throughout batch. Base air content of freshly mixed air-entrained concrete upon trial mixes with materials to be used in Work, adjusted to produce concrete of required plasticity and workability. Percentage of air entrainment in mix shall be 4 1/2 percent plus or minus 1 1/2 percent. Determine air content by testing in accordance with ASTM C 231.
   d. Use retardant when temperature exceeds 90 degrees F. Proportion as recommended by manufacturer. Use same brand as used for air-entraining agent. Add and batch material using same methods as used for air-entraining agent.

C. Sidewalk, Courtyard and Pedestrian Area Pavement
1. Mix design shall have a minimum compressive strength of 3,000 pounds per square inch at 28 days when tested in accordance with ASTM C39. Slump of concrete shall be at least 3 inches but no more than 6 inches, when tested in accordance with ASTM C143.
   a. Determine cement content in accordance with ASTM C 138 (water-cement ratio maximum 0.57). Addition of mineral filler may be used to improve workability or plasticity of concrete to limits specified.

b. Coarse dry aggregate shall not exceed 85 percent of loose volume of concrete.
c. Add air-entraining admixture to ensure uniform distribution of agent throughout batch. Base air content of freshly mixed air-entrained concrete upon trial mixes with materials to be used in Work, adjusted to produce concrete of required plasticity and workability. Percentage of air entrainment in mix shall be 4 1/2 percent plus or minus 1 1/2 percent. Determine air content by testing in accordance with ASTM C 231.
d. Use retardant when temperature exceeds 90 degrees F. Proportion as recommended by manufacturer. Use same brand as used for air-entraining agent. Add and batch material using same methods as used for air-entraining agent.

D. High Early Strength Concrete
1. Use high early strength concrete pavement to limits shown on Drawings or as required to meet the project schedule. Design to meet the following:
a. Concrete Mix: Flexural strength greater than or equal to 500 psi at 72 hours.
b. Cement: Minimum of 7 sacks of cement per cubic yard of concrete.
c. Water-Cement Ratio maximum of 0.45. Slump of concrete shall a maximum of 5 inches, when tested in accordance with ASTM C 143.

E. No additional water shall be added to the concrete at the job site.

2.03 REINFORCING STEEL

A. Provide new deformed billet steel conforming to ASTM A 615, Grade 60. Store steel to protect it from mechanical injury and rust. At time of placement, steel shall be free from dirt, scale, rust, paint, oil, or other injurious materials.

B. Cold bend reinforcing steel to shapes shown. Once steel has been bent, it may not be rebent.

C. Welded wire fabric may only be utilized if indicated on the drawings. If wire fabric is utilized provide wire fabric conforming to ASTM A 82. Use fabric in which longitudinal and transverse wires have been electrically welded at points of intersection. Welds shall have sufficient strength not to be broken during handling or placing. Conform welding and fabrication of fabric sheets to ASTM A 185.

D. Employ supports of approved shape and size that will secure reinforcing steel and joint assembly in correct position during placing and finishing of concrete. Space supports as directed by the Owner's Representative. Charis shall be W.H.C. Products, Inc. - Series "G" with sand plates; or Dayton Superior - Aztec "Castle".

2.04 ISOLATION JOINT MATERIAL

A. Filler board of selected stock. Clear, all-heart redwood weighing no more than 30 pounds per cubic foot, after being oven dried to constant weight.

B. Board filler shall be free of defects which will impair their usefulness as expansion joint fillers.

2.05 LOAD TRANSMISSION DEVICES

A. Load Transmission devices shall be as detailed on plans and conform to the properties specified in ASTM A615, Grade 60 steel.

2.06 STEEL DOWEL BARS

A. Steel dowel bars and steel reinforcement shall be deformed or smooth bars conform in properties to ASTM A 615 Grade 40. Unless otherwise shown on the plans all reinforcing steel shall be deformed bars, all dowel bars at joints shall be smooth bars, and all curb dowels shall be deformed bars.

B. Greenstreak two component speed dowel system can be used at construction joints pending engineer approval. Product submittal required for approval.

C. Greenstreak two component speed load system can be used at isolation joints pending engineer approval. Product submittal required for approval.

2.07 NONSHRINK GROUT

A. Nonmetallic, nonshrink grout containing no chloride producing agents conforming to following requirements.
   1. Compressive strength
      a. at 7 days: 3,500 psi
      b. at 28 days: 8,000 psi
   2. Initial set time: 45 minutes
   3. Final set time: 1.5 hours

2.08 LIQUID MEMBRANE-FORMING COMPOUNDS

A. Liquid membrane-forming compounds shall conform to ASTM C 309, Type 1 or Type 2, white pigmented. Membrane shall restrict loss of water to not more than 0.55 kg/m2 in 72 hours using test method ASTM C 156.

2.09 COVER MATERIALS FOR CURING

A. Polyethylene Film: Opaque pigmented white film conforming to requirements of ASTM C 171.

2.10 JOINT SEALING COMPOUND

A. Self-Leveling, Low Modulus Silicone or Polyurethane Sealant for Asphaltic Concrete and Portland Cement Concrete joints conforming to the requirements of TXDoT DMS-6310 for Class 5 Joint Sealants.

PART 3 – EXECUTION

3.01 PREPERATION

A. Verify subgrade lines and grades.

B. The subgrade shall be a previously prepared subgrade, stabilized if required, compacted to a minimum of 95% standard density ASTM D-698, and graded to the required section and grades shown on the drawings and as specified.

C. Proof-roll prepared sub-base surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

D. Rolling and sprinkling shall be performed to maintain the specified moisture content of the subgrade as necessary prior to placing the concrete.

3.02 FORMS

A. Forms shall be of wood or metal, properly treated to ensure concrete does not adhere to the forms, straight, clean, free from warp or defect, and of sufficient depth.

B. The forms shall be so placed that when placed each form section will be firmly in contact for its whole length and base width and exactly at the established grade.

C. Any subgrade under the forms below established grade shall be corrected using suitable material, placed, sprinkled, and rolled.

D. Forms shall be securely staked and tightly jointed and keyed to prevent displacement.

E. Sufficient stability of forms to support equipment operated thereon and to withstand its vibration without springing shall be required.

F. Forms shall remain in place not less than 24 hours after concrete is placed.

3.03 JOINTS

A. Shall be constructed in the pavement slab at locations and according to details as shown on the drawings. Stakes, braces, brackets or other devices shall be used as necessary to keep the entire joint assembly in true vertical and horizontal position.

B. When new Work is adjacent to existing concrete, place joints at same location as existing joints in adjacent pavement.

C. Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

D. Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

E. Form isolation joints of board filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

F. Expansion Joints shall be constructed with board filler and sealed at top. Board filler must be perpendicular to plane of concrete slab. Alignment of joint shall not vary more than 1/4 inch in 10 feet.

G. Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness. If applicable, match jointing of existing adjacent concrete pavement.

H. Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 3/16-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces..

3.04 REINFORCING STEEL

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Reinforcing Steel shall be accurately placed as shown on drawings and secured in place. Wire reinforcing bars securely together at intersections and splices. All bars shall be supported on and secured to steel or plastic bar chairs. Laps shall be a minimum of ten (10) inches and tied. Bars and coatings shall be free of rust, dirt or other foreign matter when concrete is placed.

C. Use sufficient number of chairs for steel reinforcement bars to maintain position of bars within allowable tolerances. Place reinforcement as shown on Drawings. In plane of steel parallel to nearest surface of concrete, bars shall not vary from plan placement by more than 1/12 of spacing between bars. In plane of steel perpendicular to nearest surface of concrete, bars shall not vary from plan placement by more than 1/4 inch.

D. Drill dowels into existing pavement, secure with epoxy, and provide paving headers as required to provide rigid pavement sections.

3.05 CONCRETE PLACEMENT

A. Concrete not placed as herein prescribed within 90 minutes after mixing shall be rejected.

B. Concrete shall not be placed when temperature is below 40 degrees F and falling, but may be placed when the temperature is above 35 degrees F and rising, the temperature being taken in the shade and away from artificial heat.

C. Concrete shall not be placed before the time of sunrise, and shall not be placed later than will permit the finishing of the pavement during sufficient natural light.

D. Moisten sub-base to provide a uniform dampened condition at time concrete is placed.

E. Deposit concrete continuously in successive batches. Distribute concrete in manner that will require as little rehandling as possible. Where hand spreading is necessary, distribute concrete with shovels or by other approved methods. Use only concrete rakes in handling concrete. At placement interruption of more than 30 minutes, place transverse construction joint at stopping point. Remove and replace sections less than 10 feet long.

F. Take special care in placing and spading concrete against forms and at longitudinal and transverse joints to prevent honeycombing. Voids in edge of finished pavement will be cause for rejection.

G. Concrete shall be consolidated by a mechanical vibrator to remove all voids. Special care shall be exercised in placing and spading concrete against forms and at all joints to prevent the forming of honeycombs and voids and to prevent displacement of steel reinforcement and load transmission devices.

H. The concrete shall be struck off with an approved strike-off screed to such elevation that when consolidated and finished, the surface of pavement shall conform to the required section and grade. In no case shall the maximum ordinate from a 10 foot straight edge to the pavement be greater than 1/8 inch.

I. The strike template shall be moved forward with a combined transverse and longitudinal motion in the direction the work is progressing, maintaining the template in contact with the forms, and maintaining a slight excess of material in front of the cutting edge.

3.06 FINISHING

A. Do not add water to concrete surfaces during finishing operations.

B. After completion of a strike-off, consolidation and transverse screeding, a hand-operated longitudinal float shall be operated to test and level the surface to the required grade. The longitudinal float shall be held in contact with the surface and parallel to the center line, and operated with short longitudinal strokes while being passed from one side of the pavement to the other. If contact with the pavement is not made at all points, additional concrete shall be placed if required, and screeded, and the float shall be used to produce a satisfactory surface.

C. Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform texture.
   1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
   2. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
   3. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.07 TOLERANCES

A. Test entire surface before initial set and correct irregularities or undulations. Bring surface within requirements of following test and then finish.

B. Comply with tolerances of ACI 117 and as follows:
   1. Elevation: 1/4 inch.
   2. Thickness: Plus 3/8 inch, minus 1/4 inch.
   3. Surface: Gap below 10-foot long, unleveled straightedge not to exceed 1/16 inch.
   4. Joint Spacing: 3 inches.
   5. Contraction Joint Depth: Plus 1/4 inch, no minus.
   6. Joint Width: Plus 1/8 inch, no minus.

3.08 CONCRETE PROTECTION AND CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures for a period of not less than 72 hours from the beginning of the curing operation.

B. Comply with ACI 306.1 for cold-weather protection.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Apply liquid membrane-forming compound in accordance with manufacturer's instructions.

E. Moisten concrete by water fogging prior to application of membrane when surface has become dry.

F. Seal concrete surface with single coat at rate of coverage recommended by manufacturer and directed by the Owner’s Representative, but not less than one gallon per 200 square feet of surface area.

3.09 CURBS

A. Dowelled on Curb
   1. After curing the concrete pavement, doweled on curbs, using secure forms shall be constructed to the size shown on the plans.
   2. Dowels may be placed in the pavement slab before the concrete has set, or placed in drilled holes using epoxy adhesive to secure the bars in place.
   3. Pavement joints shall extend through the curbs. Expansion joint material shall be the same thickness, type and quality as specified for the pavement.
   4. When sawed joints are provided, the placement of curb shall be delayed until all transverse joints are sawed.
   5. All joints should be tool finished after sufficient curing of the concrete.
   6. The concrete, reinforcement and curing of the curbs shall conform to the requirements specified for the concrete pavement.
   7. In finishing the curbs, a thin coating of mortar shall be worked into the exposed face of the curb in order to obtain a brush finish free of all blemishes and form or tool marks.
   8. Curbs shall have a straightness tolerance of 1/8 inch in 10 feet, measured longitudinally along the back and face of the curb.
   9. The top of the curb shall not vary vertically in height more than 1/8" when measured up from the concrete pavement.

B. Monolithic Curbs and Curb and Gutter
   1. Monolithic curb and curb and gutter shall conform to the specifications for doweled on curb and the details shown on the plans.
   2. Monolithic curb and curb and gutter shall be constructed after final grading of the subgrade and before placement of the base material.
   3. These curbs shall be cured for at least 72 hours and shall be properly backfilled behind the curb by hand tamping to 95% standard proctor density ASTM D 698 before placing the base material.

3.10 APPLICATION OF JOINT SEALING COMPOUND

A. Joints shall be thoroughly cleaned of loose scale, dirt, dust, and curing compound. When necessary, existing joint material shall be removed to the depth as shown on the plans.

B. Joints shall be filled to the full depth of the joint opening. Pouring shall be done in a neat and workman like manner to give satisfactory results. Sufficient joint sealer shall be poured into the joints so that upon the completion of the work the surface of sealer within the joint shall be 1/4" above top of the pavement surface.

3.11 FIELD QUALITY CONTROL

A. Compressive Strength Test Specimens: Make four test specimens for compressive strength test in accordance with ASTM C 31 for each 150 cubic yards or less of pavement that is placed in one day. Test two specimens at 7 days or at number of hours as directed by the Owner's Representative for high early strength concrete. Test remaining two specimens at 28 days. Test specimens in accordance with ASTM C 39. Laboratory technician will prepare concrete test cylinders.

B. When compressive test indicates failure, make yield test in accordance with ASTM C 138 for cement content per cubic yard of concrete. When cement content is found to be less than that specified per cubic yard, increase batch weights until amount of cement per cubic yard of concrete conforms to requirements.

C. Minimum of one 4 inch core will be taken at random locations per 5,000-square feet of pavement to measure in-place depth. Measure depth in accordance with ASTM C 174. Each core may be tested for 28 day compressive strength according to methods of ASTM C 42. 28 day compressive strength of each core tested shall be a minimum of 3,000 pounds per square inch.

D. Request, at option, three additional cores in vicinity of cores indicating nonconforming inplace depths at no cost to the Owner. In-place depth at these locations shall be average depth of four cores.

E. Fill cores and density test sections with new concrete paving or non-shrink grout.

3.12 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage.

C. The pavement shall be closed to all traffic, including vehicles of the Contractor, until the concrete is at least 7 days old or has attained a minimum average of 3,000 psi compressive strength.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

E. Any damage to the pavement prior to acceptance by the Owner shall be repaired by the Contractor at no extra cost to the Owner.

END OF SECTION 32 13 13

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SECTION 32 17 23.13 – PAINTED PAVEMENT MARKINGS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section pertains to the application of pavement marking as indicated on the drawings and as specified herein.

1.02 REGULATORY REQUIREMENTS

A. Contractor shall comply with all current, applicable codes and regulations.

B. Contractor shall comply with all Standard Specifications and Details of Authorities having Jurisdiction (herein after referred to as "Standard Specifications") for work in the right-of-way or easements.

C. Prior to commencement of work, the Contractor shall be responsible for obtaining, at the Contractor's own expense, all construction permits necessary to complete the project according to the plans and specifications.

1.03 SUBMITTALS

A. Product Data: For each type of product; include technical data and tested physical and performance properties.

B. As requested by the Owner's Representative submit Shop Drawings for pavement markings.
   1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
   2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. As requested by the Owner's Representative submit samples for each product and for each color and texture specified; on rigid backing, 8 inches (200 mm) square.

1.04 QUALITY ASSURANCE

A. Comply with materials, workmanship, and other applicable requirements of the Harris County Engineering Specifications latest edition for pavement-marking work.

PART 2 – PRODUCTS

2.01 CONFORMANCE OF FINISHED PRODUCTS

A. Conformance of Finished Products. Coatings shall conform on a weight basis, to the composition requirements of the standard formula. No variation from the standard formula will be permitted except for replacement of materials lost in processing, or those approved by the Engineer. The finished coatings shall conform with all requirements stipulated for each standard formula and in addition shall equal a Wet Standard in characteristics such as color, drying, flow, settling, brush ability, can stability, hiding, etc.

B. Film characteristics such as gloss, hardness, light permanency, adhesion, etc., shall also conform. When testing for such conformity, the coating shall be applied and tested under parallel conditions with the Wet Standard.

C. The finished product shall be free of skins and foreign materials.

2.02 PAINTS

A. Paint for stripping shall be 100% acrylic premium grade traffic paint conforming to the requirements of FS TT-P-1952 Type 1; latest edition.

B. Colors shall be as shown on the Drawings or designated by the Owner's Representative from the following:

1. White
2. Yellow
3. Blue
4. Red
5. Black
6. Green

2.03 GLASS REFLECTIVE BEADS

A. Glass reflective beads shall conform to the requirements of FS TT-B1325 - Type 1; latest edition.

PART 3 – EXECUTION

3.01 PREPERATION

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Owner's Representative.

B. Allow paving to age for a minimum of 30 days before starting pavement marking.

C. The pavement surface to receive the striping shall be thoroughly cleaned of all dirt, organic growth, oil, grease, or other materials that will prevent adhesion of the paint to the roadway surface.

3.02 LAYOUT

A. The pavement markings shall be placed in proper alignment with guidelines established on the roadway. Deviation from the alignment established shall not exceed 2 inches and, in addition, the deviation in alignment of the marking being placed shall not exceed 1 inch per 200 feet of roadway nor shall any deviation be abrupt.
   1. No striping material shall be applied over a guide cord; only longitudinal joints, existing stripes, primer, or other approved type guides will be permitted. In the absence of a longitudinal joint or existing stripe, the Contractor shall mark the points necessary for the placing of the proposed stripe. Edge striping shall be adjusted as necessary so that the edge stripe will be parallel to the centerline and shall not be placed off the edge of the pavement.
   2. Longitudinal markings shall be offset at least 2-inches from construction joints of portland cement concrete surfaces and joints and shoulder breaks of asphalt surfaces.

3.03 APLICATION

A. Paints shall be applied by brush, spray, or flow methods to clean and dry surfaces with surface temperature 50 F or above.

B. Traffic paint shall be applied with a minimum thickness of 10 mils, measured in dry condition, prior to adding any glass reflective spheres.

C. Paint striping shall be applied and measured to ± 1/4" of the specified widths.

D. Paint shall be applied as shown on drawings.

E. Where required glass spheres or reflectorized granules shall be applied, before the paint sets or dries, evenly at a rate of 6 pounds of glass spheres or 1.7 pounds of reflectorized granules per gallon of paint.

END OF SECTION 32 17 23.13

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SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Chain-link fences.
   2. Gates: Swing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
   1. Fence and gate posts, rails, and fittings.
   2. Chain-link fabric, reinforcements, and attachments.
   3. Accessories: Privacy slats.
   4. Gates and hardware.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show accessories, hardware, gate operation, and operational clearances.

C. Delegated-Design Submittal: For chain-link fences and gate framework indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of chain-link fence, and gate, from manufacturer.

B. Product Test Reports: For framing strength according to ASTM F 1043.

C. Field quality-control reports.

D. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the following to include in emergency, operation, and maintenance manuals:
   1. Gate hardware.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design chain-link fences and gates, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Chain-link fence and gate framework shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7:
1. Minimum Post Size: Determine according to ASTM F 1043 for framework up to 12 feet high, and post spacing not to exceed 10 feet.

2.2 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with CLFMI Product Manual and with requirements indicated below:
1. Fabric Height: As indicated on Drawings.
2. Steel Wire Fabric: Wire with a diameter of 0.148 inch .
a. Mesh Size: 2 inches.
b. with zinc coating applied .
c. Polymer-Coated Fabric: ASTM F 668, Class 2a over zinc -coated steel wire.
1) Color: Black, complying with ASTM F 934.
3. Selvage: Knuckled at both selvages.

2.3 FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 based on the following:
1. Fence Height: As indicated on Drawings.
2. Light Industrial Strength: Material Group IC-L, round steel pipe, electric-resistance-welded pipe.
a. Line Post: 2.375 inches in diameter .
b. End, Corner and Pull Post: 2.875 inches .
3. Horizontal Framework Members: Intermediate top and bottom rails complying with ASTM F 1043.
a. Top Rail: 1.66 inches in diameter.
4. Brace Rails: Comply with ASTM F 1043.
5. Metallic Coating for Steel Framing:
a. Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123/A 123M or 4.0-oz./sq. ft. zinc coating per ASTM A 653/A 653M.
6. Polymer coating over metallic coating.
a. Color: Black, complying with ASTM F 934.

2.4 TENSION WIRE

A. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire complying with ASTM A 817 and ASTM A 824, with the following metallic coating:

B. Polymer-Coated Steel Wire: 0.148-inch- diameter, tension wire complying with ASTM F 1664, Class 2a over zinc -coated steel wire.
1. Color: Black, complying with ASTM F 934.

2.5 SWING GATES

A. General: Comply with ASTM F 900 for gate posts and single swing gate types.
1. Gate Leaf Width: As indicated.

B. Pipe and Tubing:
1. Zinc-Coated Steel: Comply with ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framing.
2. Gate Posts: Round tubular steel Round tubular aluminum .
3. Gate Frames and Bracing: Round tubular steel.

C. Frame Corner Construction: Welded.

D. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame 12 inches to attach barbed wire assemblies.

E. Hardware:
1. Hinges: Heavy duty hydraulic hinge. Locinox; Mammoth 180 Hydraulic Gate Closer.

2.6 FITTINGS

A. General: Comply with ASTM F 626.

B. Post Caps: Provide for each post.
1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:
1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
a. Hot-Dip Galvanized Steel: 0.106-inch- diameter wire[; galvanized coating thickness matching coating thickness of chain-link fence fabric].

I. Finish:
1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.
a. Polymer coating over metallic coating.

2.7 PRIVACY SLATS

A. Material: PVC, UV-light stabilized, flame resistant, four ply, not less than 0.006 inch thick; attached to not less than 0.0475-inch- diameter, twisted galvanized wire; hedge-type lattice; sized to fit mesh specified for direction indicated.

B. Color: As selected by Architect from manufacturer's full range.

2.8 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements indicated.
1. Install fencing on established boundary lines inside property line.

3.4 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.

C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

D. Line Posts: Space line posts uniformly at 96 inches o.c.

E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:
1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

H. Intermediate and Bottom Rails: Install and secure to posts with fittings.

I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.

J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.Peen ends of bolts or score threads to prevent removal of nuts.

L. Privacy Slats: Install slats in direction indicated, securely locked in place.

3.5 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed

means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware, gate operator, and other moving parts.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain chain-link fences and gates.

END OF SECTION 323113

SECTION 32 92 00 – TURF AND GRASSES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section pertains to the establishment of vegetative cover by hydromulching or sodding as indicated on the drawings and as specified herein.

1.02 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

E. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.03 REGULATORY REQUIREMENTS

A. Contractor shall comply with all current, applicable codes and regulations.

B. Contractor shall comply with all Standard Specifications and Details of Authorities having Jurisdiction (herein after referred to as "Standard Specifications") for work in the right-of-way or easements.

C. Prior to commencement of work, the Contractor shall be responsible for obtaining, at the Contractor’s own expense, all construction permits necessary to complete the project according to the plans and specifications.

1.04 SUBMITTALS

A. Submit certification from supplier that each type of seed conforms to these specifications and requirements of Texas Seed Law. Certification shall accompany seed delivery.

B. Submit certificate stating that fertilizer complies with these specifications and requirements of Texas Fertilizer Law.

C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

D. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.05 QUALITY ASSURANCE

A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory.
   1. Report suitability of topsoil for lawn growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

PART 2 – PRODUCTS

2.01 HYDROMULCH

A. Seed: Conform to U.S. Department of Agriculture rules and regulations of Federal Seed Act and Texas Seed Law. Seed shall be certified 90 percent pure and furnish 80 percent germination and meet following requirements:

1. Rye: Fresh, clean, Italian rye grass seed (lollium multi-florum), mixed in labeled proportions. As tested, minimum percentages of impurities and germination must be labeled. Deliver in original unopened containers.
2. Bermuda: Extra-fancy, treated, lawn type common bermuda (Cynodon dactylon). Deliver in original, unopened container showing weight, analysis, name of vendor, and germination test results.
3. Wet, moldy, or otherwise damaged seed will not be accepted.
4. Seed requirements, application rates, and planting dates are:

TYPE	APPLICATION RATE (Lb/Ac)	PLANTING DATE
Hulled Common Bermuda Grass 98/88 Unhulled Common Bermuda Grass 98/88	40 40	Jan 1 to Mar 31
Hulled Common Bermuda Grass 98/88	40	Apr 1 to Sep 30
Hulled Common Bermuda Grass 98/88 Unhulled Common Bermuda Grass 98/88 Annual Rye Grass (Gulf)	40 40 30	Oct 1 to Dec 31

B. Shall be 13-13-13 grade, pelleted, uniform on composition, free-flowing, and suitable for application with approved equipment. The fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable state fertilizer laws, and bearing the name or trademark and warrant of the producer.

C. Wood Cellulose fiber mulch, for use with the hydraulic application of grass seed and fertilizer, shall consist of specially prepared wood cellulose fiber. It shall be processed in such a manner that it will not contain germination of growth inhibiting factors. It shall be dyed a green color to allow visual metering of its application. The wood cellulose fibers shall have the property of becoming evenly dispersed and suspended when agitated in water. When sprayed uniformly on the surface of the soil, the fibers shall form a blotter-like groundcover which readily absorbs water and allows infiltration to the underlying soil. Weight specifications from suppliers for all applications shall refer only to air dry weight of the fiber, a standard equivalent to eighteen (18%) percent moisture. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds and be marked by the manufacturer to show the dry weight content. Suppliers shall be prepared to certify that laboratory and field testing of their product has been accomplished and that meets all of the foregoing requirements.

D. Soil Stabilizer: "Terra Tack 1" or approved equal.

E. Weed control agent: Pre-emergent herbicide for grass areas, such as "Benefin," or approved equal.

2.02 SOD

A. Species: Bermuda (Cynodon Dactylon), Buffalo (Buchloe Dactyloides), or St. Augustine (Stenotaphrum Secundatum) Gulf Coast variety to match existing sod or as indicated on the Drawings.

B. Contents: 95 percent permanent grass suitable to climate in which it is to be placed; not more than 5 percent weeds and undesirable grasses; good texture, free from obnoxious grasses, roots, stones and foreign materials.

1. Sod shall be rejected if found to contain any amount of the following weeds:
   a. Quackgrass.
   b. Johnson grass.
   c. Poison ivy.
   d. Nimbleweed.
   e. Thistle.
   f. Bindweed.
   g. Bentgrass.

h. Perennial sorrel.
i. Bromegrass.

C. Size: 12 inch wide strips, uniformly 2 inches thick with clean-cut edges. Rhizome development should be apparent.

D. Sod is to be supplied and maintained in healthy condition as evidenced by grass being normal green color.

2.03 TOP DRESS FERTILIZER

A. (Delayed Application) Complete fertilizer, fifty (50%) percent of the nitrogen to the derived from natural organic sources or urea-form. Available phosphoric acid shall be from superphosphate, bond, or tankage. Potash shall be derived from muriate of potash containing sixty (60%) percent potash:
1. 16% Nitrogen
2. 6% Phosphoric Acid
3. 8% Potash

PART 3 – EXECUTION

3.01 PREPERATION

A. Verify that grades are within 1-inch plus or minus the required finished grades. Verify that all soil preparation has been completed and approved. Report all variations in writing.

B. Stones, Weeds, Debris: Verify that all areas to receive lawns and grasses are clear of stones larger than 1/2 inch in diameter, weeds, debris, and other extraneous materials.

C. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

E. Contractor shall obtain approval of hydromulch area preparation from the Owner's Representative prior to beginning turf establishment.

3.02 SODDING

A. Sod Bed Preparation:
1. Rolling: Roll amended soil with 200 pound water-ballast roller.
2. Moistening Soil Surface: After all unevenness in the soil surface has been corrected, lightly moisten the soil immediately prior to laying the sod.
3. Timing: Sod immediately thereafter, provided the sod bed has remained in friable condition.

B. Sodding Operations :
1. Big roll sod shall be installed by tractors with proper flotation tires of by an approved big roll sod installation machine. Care should be taken to roll out sod at a proper speed so that no humping or tearing of sod occurs. Sod will be manually pulled together by stiff rakes to insure no gaps remain in the seams. Joints should be staggered. Damaged or problem areas shall be cut out and replaced in a professional matter.
2. Starter Strip:
a. Lay first row of sod in a straight line, with subsequent rows parallel to and tightly against each other.
b. Stagger lateral joints.
c. Do not stretch or overlap sod.
d. Butt all joints tightly to eliminate all voids.
3. Cutting: Use a sharp knife to cut sod to fit curves, surface components of the irrigation system or other items.

4. Tamping and Rolling: Thoroughly tamp and roll sod to make contact with sod bed. Roll each entire section of completed sod.
5. Watering: Thoroughly water sod immediately after installation to wet the underside of the new sod pad and the soil immediately below to a depth of 6 inches. Maintain constant moisture for 2 weeks or until sod is fully rooted.
6. Top-Dress Fertilizer: Apply at the rate of (6) to (8) pounds per 1,000 square feet at 25 days and at 50 days after sodding.

3.03 HYDROMULCH SEEDING

A. Operators of hydromulching equipment shall be thoroughly experienced in this type of application. Apply specified slurry mix in a motion to form a uniform mat at specified rate.

B. Mixing: Care shall be taken that the slurry preparation should be accomplished per the material supplier's recommendations and the equipment manufacturer's written operations manual. Spraying shall commence immediately when the slurry is mixed and the tank is full. The operator shall spray the area with a uniform, visible coat by using the green color of the wood pulp as a guide.

C. Keep hydromulch within areas designated and keep from contact with other plant material.

D. Slurry mixture which has not been applied within four (4) hours of mixing shall not be used and shall be removed from the site.

E. After application, the Contractor shall not operate any equipment over the covered area.

F. Immediately after application, thoroughly wash off any plant material, planting areas, or paved areas not intended to receive slurry mix. Keep all paved and planting areas clean during maintenance operations.

G. Refer also to the maintenance portion of this section.

H. All areas designed on drawings shall be covered uniformly with specified materials using hydromulching processes. If surfaces remain uncovered within the designated area, the Contractor shall seed with required grasses or ground cover materials those areas missed by the hydromulch application. Method used to seed these missed surfaces shall be an alternate seeding operation approved by the Architect/Engineer/Owner's Representative and shall be accomplished at no additional cost to the Owner.

3.04 MAINTENANCE

A. The Contractor shall provide full maintenance by skilled employees of the landscape installer to maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation.

B. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
1. Seeded Lawns: 90 days from date of planting completion.
2. For areas seeded in fall or if lawn is not fully established, continue maintenance following spring until acceptable lawn is established.
3. Sodded Lawns: 30 days from date of planting completion.

C. Repair areas damaged by erosion by regrading, rolling and replanting.

D. Reseed small, sparse grass areas. When sparse areas exceed 20 percent of planted area, reseed by hydromulch.

E. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowing.

3.05 WARRANTY

A. Time Period: Warrant that lawns are in healthy and flourishing condition of vigorous active growth one year from date of Final Acceptance.

B. Appearance During Warranty: Lawns shall be free of dead or dying patches, and all areas shall show foliage of a normal density, size and color.

C. Delays: Delays caused by the Contractor in completing planting operations which extend the planting into more than one planting season shall extend the Warranty Period correspondingly.

D. Exceptions: Contractor shall not be held responsible for failures due to neglect by Owner, vandalism, or Acts of God during Warranty Period. Report such conditions in writing.

3.06 FINAL ACCEPTANCE

A. Work under this Section will be accepted by the Owner's Representative upon satisfactory completion of all work, but exclusive of re-application under the Guarantee Period. Final Acceptance of lawn establishment shall be as follows:
   1. For Seed: Ninety Five (95%) percent uniform coverage of grass in excess of one (1") inch height. No bare spots of greater than two (2) square feet will be accepted.
   2. For Sod: At end of maintenance period, a healthy, well-rooted, even-colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. The Owner's Representative shall interpret the above. Upon Final Acceptance, the Owner will assume the responsibility for maintenance of the work.

END OF SECTION 32 92 00

SECTION 33 10 00 – WATER DISTRIBUTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for furnishing and installing water lines, laterals, stubs, and appurtenances for both potable and non-potable water distribution systems. The pipe shall be of the size, type and location, and to the lines, grades and elevations shown on the plans and constructed in accordance with these specifications.

1.02 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.03 REGULATORY REQUIREMENTS

A. Contractor shall comply with all Standard Specifications and Details of Authorities having Jurisdiction (herein after referred to as "Standard Specifications") for work in the right-of-way or easements.

B. Prior to commencement of work, the Contractor shall be responsible for obtaining, at the Contractor's own expense, all construction permits necessary to complete the project according to the plans and specifications.

C. Regulatory Requirements for potable water systems:
   1. Contractor shall comply with requirements of utility company supplying water; including tapping of water mains and backflow prevention.
   2. Contractor shall comply with standards of authorities having jurisdiction for potable water service piping, including materials, installation, testing, and disinfection.

D. Regulatory Requirements for Non-potable water systems:
   1. The system shall be comprised of purple components. Use purple colored pipe, Pantone 522 embossed or integrally stamped/marked in English and in Spanish "CAUTION RECLAIMED WATER DO NOT DRINK" and "AGUA DE RECUPERACIÓN - NO BEBER".
   2. A minimum of an eight inch by eight-inch sign, in English and Spanish, is prominently posted on/in the area that reads "Reclaimed Water – Do not drink" and "AGUA DE RECUPERACIÓN - NO BEBER" on the storage tank of such non-potable system if within the construction site.
   3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

C. Field quality-control test reports.

1.05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

C. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

D. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

E. NSF Compliance:
   1. Comply with NSF 14 for plastic potable-water-service piping.[Include marking "NSF-pw" on piping.]
   2. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.

PART 2 – PRODUCTS

2.01 PVC PIPE

A. Provide self-extinguishing PVC pipe that bears Underwriters' Laboratories mark of approval and is acceptable without penalty to Texas State Fire Insurance Committee for use in fire protection lines.

B. Bear National Sanitation Foundation Seal of Approval (NSF-PW).

C. Pipe 3-inch diameter and less: PVC I.P.S. ASTM D2241, SDR 26; SDR 21 as alternate to offset pipe sections or for construction within 9 feet of any existing or proposed sanitary sewer; nominal 20-foot lengths; cast-iron equivalent outside diameters.

D. Pipe 4-inch through 12-inch: AWWA C 900, DR 18; DR 14 as alternate to offset pipe sections or for construction within 9 feet of any existing or proposed sanitary sewer; nominal 20-foot lengths; cast-iron equivalent outside diameters.

E. Pipe 14-inch through 20-inch: AWWA C 905; 235 psi; DR 18; nominal 20-foot lengths; cast iron equivalent outside diameter.

F. Gaskets:
   1. Gaskets shall meet requirements of ASTM F 477. Use elastomeric factory-installed gaskets to make joints flexible and watertight.
   2. Flat Face Mating Flange: Full faces 1/8-inch-thick ethylene propylene (EPR) rubber.
   3. Raised Face Mating Flange: Flat ring 1/8-inch ethylene propylene (EDR) rubber, with filler gasket between OD of raised face and flange OD to protect flange from bolting moment.

G. Do not use PVC in potentially or known contaminated areas.

H. Do not use PVC in areas exposed to direct sunlight.

I. Make curves and bends by bending the pipe, do not exceed maximum limits of curvature recommended by pipe manufacturer. Submit details of other methods of providing curves and bends for review by the Owner’s Representative

2.02 DUCTILE IRON PIPE

A. Ductile iron pipe shall conform to AWWA C115, C150 and C151 and bear mark of Underwriters’ Laboratories approval. Unless otherwise shown on Drawings, use minimum Pressure Class 250 for water lines or thickness Class 52 for water lines in casing or augured hole. Provide minimum Pressure Class 350 for flanged pipe.

B. Provide standard outside coating with cement mortar lining to AWWA C 104 standards.

C. Provide pipe sections in standard lengths, not less than 18 feet long, except for special fittings and closure sections as indicated on shop drawings.

D. Provide flange adapter with insulating kit as required when connecting new piping to existing piping and piping of different materials, unless otherwise approved by the Owner’s Representative.

E. No welding will be permitted on Ductile Iron Pipe except at restrained joint spigots. No field welding is allowed.

F. Gaskets
   1. Furnish, when no contaminant is identified, plain rubber (SBR) gasket material in accordance with ANSI A21.11 or ASTM F 477 (One Bolt only); for flanged joints 1/8-inch-thick gasket in accordance with ANSI A 21.15.
   2. For Pipes to be installed in contaminated areas, use gaskets as recommended by the Pipe Manufacturer, and approved by the Owner's Representative prior to installation.

G. All ductile iron pipe and fittings shall be wrapped with polyethylene per AWWA C 105.

2.03 JOINTS

A. Joint Types: ANSI A 21.11 push-on; ANSI A 21.11 mechanical joint; or ANSI A 21.16 flanged end. Provide push-on restrained joints unless otherwise indicated on the Drawings or required by these specifications. For bolted joints, conform to requirements of AWWA C111; provide minimum 304 stainless steel for restraint joints.

B. Where required by Drawings, provide approved restrained joints for buried service.

C. Threaded or grooved-type joints which reduce pipe wall thickness below minimum required are not acceptable.

D. Provide for restrained joints designed to meet test pressures required under 3.8 of this Section. Provide restrained joints for test pressure or maximum surge pressure as specified, whichever is greater for water lines. Do not use passive resistance of soil in determining minimum restraint lengths.

2.04 FITTINGS

A. Use fittings of same size as pipe. Reducers are not permitted to facilitate an off-size fitting. Reducing bushings are also prohibited. Make reductions in piping size by reducing fittings. Line and coat fittings as specified for pipe they connect to.

B. Fittings shall conform to AWWA C 153, latest edition, pressure rated at 250 psi and shall be fusion bonded epoxy lined or cement mortar lined. Unless otherwise noted on the drawings or required by the authority having jurisdiction provide mechanical joint fittings.

C. Mechanical Joint Fittings: ANSI A 21.11; pressure rated at 250 psi.

D. Push-on Fittings: ANSI A 21.10; ductile iron ANSI A 21.11 joints, gaskets, and lubricants; pressure rated at 250 psi.

2.05 GATE VALVES

A. Gate Valves 2 inches in diameter: Iron body resilient-seated, non-rising stem, 150-pound test, 2-inch square nut operating clockwise to open.

B. Gate Valves 3 inches to 12 inches in diameter: Non-directional, standard-wall resilient seated (AWWA C 509), 200 psi pressure rating, bronze mounting, mechanical joint ends with rubber joint rings, and nut-operated unless otherwise specified.

C. Gate valves 14 inch and larger in Diameter: AWWA C 500; parallel seat double disc gate valves; mechanical joint ends with rubber rings and nut-operated unless otherwise specified. Provide approved double disc valves with 150 psi pressure rating.

D. Gate Valves Extension Stem: Provide non-rising, extension stem having coupling sufficient to attach securely to operating nut of valve. Upper end of extension stem shall terminate in square wrench nut no deeper than 4 feet from finished grade or as shown on Drawings. Support extension stem with an arm attached to wall of manhole or structure that loosely holds extension stem and allows rotation in the axial direction only.

E. Gate Valves in Factory Mutual (Fire Service) Type Meter Installations: Conform to provisions of this specification; outside screw and yoke valves; carry label of Underwriters' Laboratories, Inc.; flanged, Class 125; clockwise to close.

F. The operating nut shall be 2-inch square and shall have an arrow, cast in the metal, indicating the counter-clockwise direction of opening.

G. Gate Valves for Tapping Steel Pipe: Provide double disc gate valve. Resilient wedge gate valve shall only be installed in a vertical position.

H. Provide flanged joints when valve is connected to steel or PCCP.

I. Key valve stem into the operator nut.

J. Unless otherwise specified, all gate valves shall be installed complete with valve box.

K. Do not exceed 600 ft-lbs of torque on operator nut on gate valve.

2.06 TAPPING SLEEVES AND VALVES

A. Tapping Sleeves:
   1. Tapping Sleeve Bodies: AWWA C 110 cast or ductile iron or AWWA C 200 carbon steel in two sections to be bolted together with high-strength, corrosion-resistant, low-alloy steel bolts with mechanical joint ends.
   2. Branch Outlet of Tapping Sleeve:
   3. Flanged, machined recess, AWWA C 207, Class D, ANSI 150 pound drilling.
   4. Gasket: Affixed around recess of tap opening to prevent rolling or binding during installation.
   5. Use cast iron split sleeve where fire service from 6-inch water line is approved.

B. Tapping Valves: Meet requirements of 2.05 above with the following exceptions:
   1. Inlet Flanges:
   2. AWWA C 110; Class 125.
   3. AWWA C 110; Class 150 and higher: Minimum 8-hole flange.
   4. Outlet: Standard mechanical or push-on joint to fit any standard tapping machine.
   5. Valve Seat Opening: Accommodate full-size shell cutter for nominal size tap without contact with valve body; double disc.

2.07 VALVE BOXES

A. Provide approved Type A, cast-iron/ductile-iron, slide-type, valve boxes. Design of valve box shall minimize stresses on valve imposed by loads on box lid.

B. Cast letter “W” into lid, 1/2 inch in height and raised 3/32 inch, for valves serving potable water lines.

C. Unless otherwise specified, uncoated cast iron.

D. Riser Pipe.
   1. Provide 6-inch PVC, DR 18, riser pipes in accordance with 2.01 above.
   2. 6-inch ductile-iron, thickness Class 51 riser pipes in accordance with 2.02 above.
   3. Provide single section of pipe.

E. Concrete for valve box placement:
   1. For locations in new concrete pavement, provide strength and mix design of new pavement.
   2. For other locations, provide concrete for sidewalks conforming to requirements of Section 32 13 13 Concrete Paving.

2.08 FIRE HYDRANTS

A. Fire hydrants shall be Mueller Super Centurion or an approved equivalent.

B. Each hydrant shall be factory tested to a hydrostatic pressure of 300 psi with valve in both the open and closed positions. The direction of opening nut shall be counterclockwise and shall be cast on the head of the hydrant. Hose nozzles shall be bronze or non-corrosive metal and threads shall be national standard. The main valve opening shall be either five and one fourth (5 1/4) inches in diameter or six and one fourth caps shall be provided with gaskets. Bury length shall be three and one half (3 1/2) feet unless otherwise noted on the plans. Hydrants shall be provided with "dry top" which prevents stem threads from contacting water, and "break off" type barrel and stem.

C. Hydrants shall be painted with shop coating in accordance with AWWA C502 specification. Final coats of paint will be applied by Contractor in accordance with the requirements of the authority having jurisdiction.

D. Contractor shall verify and provide nozzle threads consistent with the requirements of the authority having jurisdiction.

2.09 MANUFACTURERS

A. Use approved American manufacturers.

PART 3 – EXECUTION

3.01 PREPERATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage and displacement.

B. Verify all existing utilities prior to beginning construction. Inform the Owner's Representative if existing utilities are not as shown in the plans.

C. Water service to the site or adjacent landowners shall not be shut down without prior approval of the Owner's Representative and the authority having jurisdiction. At no additional cost to the Owner the Contractor shall install necessary valves so as not to disrupt service outside limits of water lines to be lowered/relocated whether or not indicated on the plans.

D. Confirm that nine feet minimum separation from gravity sanitary sewers and manholes or separation of four feet minimum from force mains in all directions. Where above clearances cannot be attained, provide protection per the requirements of the drawings and obtain additional instructions as required from the Owner's Representative before proceeding with construction.

3.02 GENERAL

A. Unless otherwise specified, the provisions of this section shall conform to AWWA C600 and C605, latest editions.

B.

3.03 CLEANING AND INSPECTION

A. Cleaning: Thoroughly clean and dry interior of pipe and fittings of foreign matter before installation, and keep interior clean until Work has been accepted. Keep joint contact surfaces clean until jointing is completed. Do not place debris, tools, clothing or other materials in pipe. After pipe laying and joining operations are completed, clean inside of pipe and remove debris. The interior of the pipe shall be kept clean throughout the duration of the work.

B. Inspection: Before installation, inspect each pipe and fitting for defects. Reject defective, damaged or unsound pipe and fittings and remove them from site.

3.04 EARTHWORK

A. Conform to applicable provisions of Section 31 23 33 Trenching, Backfilling and Compaction.

B. Backfill excavated areas in same day excavated. When not possible, cover excavated areas using steel plates on paved areas and other protective measures elsewhere.

C. Place material in uniform layers of prescribed maximum loose thickness and wet or dry material to approximately optimum moisture content. Compact to prescribed density Water tamping is not allowed.

D. When trenches exceed five feet in depth Contractor shall utilize trench safety measures per Section 31 41 33 Trench Safety.

3.05 PIPE CUTTING

A. Cut pipe 12 inches and smaller with standard wheel pipe cutters. Cut pipe larger than 12 inches in manner approved by the Owner's Representative. Make cuts smooth and at right angles to axis of pipe. Bevel plain end with heavy file or grinder to remove sharp edges.

3.06 LOWERING/RELOCATING EXISTING WATER LINES

A. Water lines to be lowered/relocated shall not be shut down without prior approval of the local governing agency.

B. Whether or not indicated on the plans, any existing water lines that are in conflict with proposed utilities shall be the lowered/relocated as necessary to facilitate construction, at no additional cost to the Owner.

C. Contractor shall install necessary valves so as not to disrupt service outside limits of water lines to be lowered/relocated whether or not indicated on the plans.

D. Whether or not indicated on the plans, the lowered/relocated water line shall have minimum of four (4) feet of cover. Location shall be a minimum distance from existing location as necessary to facilitate construction.

E. If the lowered/relocated water lines are of potable water systems, they shall be required to meet same hydrostatic and sterilization test results as new water lines.

F. Installation of lowered/relocated water lines shall meet the same requirements of new water lines as in paragraph 3.07 below.

3.07 PIPING INSTALLATION

A. General Requirements:
1. Lay pipe in subgrade free of water.
2. Make adjustments of pipe to line and grade by scraping away subgrade or filling in with granular material.
3. For potable water line installation, when a water line is being installed parallel to a sanitary sewer, a horizontal distance of separation of nine (9) feet (outside to outside) must be maintained.
4. A minimum clearance of 12" must be maintained between water lines and all other utility lines.
5. For potable water line installation, when a water line is to be installed such that it will cross over an existing or proposed sanitary sewer, a section of pipe at least 18' long of either ductile iron or PVC pipe C-900 DR-18 shall be installed such that it will be centered over the sanitary sewer. Water lines shall in no case be installed below a sanitary sewer.
6. Properly form bedding to fully support bell without wedging or blocking up bell.
7. Open Cut Construction: Keep pipe trenches free of water which might impair pipe laying operations. Grade trench to provide uniform support along bottom of pipe. Excavate for bell holes after bottom has been graded and in advance of placing pipe. Lay not more than 500 feet of pipe in trench ahead of backfilling operations. Cover or backfill laid pipe if pipe laying operations are interrupted and during non-working hours. Place backfill carefully and simultaneously on each side of pipe to avoid lateral displacement of pipe and damage to joints. If adjustment of pipe is required after it has been laid, remove and re-lay as new pipe.

B. Protection of Pipeline: Securely place stoppers or bulkheads in openings and in end of line when construction is stopped temporarily and at end of each day's work.

C. For tie-ins to existing water lines, provide necessary material on hand to facilitate connection prior to connecting to or shutting down existing water line. Provide the authority having jurisdiction and the Owner's Representative a minimum of two weeks notice prior to connecting to or shutting down existing water line.

D. Make curves and bends as recommended by manufacturer and approved by the Owner's Representative.

E. Deflection of pipe joints shall not exceed maximum deflection recommended by pipe manufacturer.

F. When rubber gasketed pipe is laid on curve, join pipe in straight alignment and then deflect to curved alignment.

G. Every valve, including bypass valves, shall be provided with a valve box. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the operating nut, with the cover flush with the pavement surface or such other level as directed.

H. Hydrants shall be located as shown on the Plans and in a manner that will provide complete accessibility and will prevent damage from vehicles. All hydrants shall stand plumb and shall have their pumper connections at right angles to the street.

I. Minimum cover on water lines shall be 48 inches unless otherwise specified, but in no case shall the top of any water line be less than 24 inches below the finished ground surface.

3.08 JOINTS AND JOINTING

A. Rubber Gasketed Bell-and-Spigot Joints:
   1. After rubber gasket is placed in spigot groove of pipe, equalize rubber gasket cross section by inserting tool or bar recommended by manufacturer under rubber gasket and moving it around periphery of pipe spigot.
   2. Lubricate gaskets with nontoxic water-soluble lubricant before pipe units are joined.
   3. Fit pipe units together in manner to avoid twisting or otherwise displacing or damaging rubber gasket.
   4. After pipe sections are joined, check gaskets to ensure that no displacement of gasket has occurred. If displacement has occurred, remove pipe section and remake joint as for new pipe. Remove old gasket, inspect for damage and replace if necessary before remaking joint.
   5. Use restrained joints as shown on Drawings.
      a. Include buoyancy conditions for soil unit weight when computing thrust restraint calculations.
      b. Do not include passive resistance of soil in thrust restraint calculations.
   6. Except for PVC pipe, provide means to prevent full engagement of spigot into bell as shown on Drawings. Means may consist of wedges or other types of stops as approved by the Owner's Representative.

B. Restrained Joints
   1. Installation.
      a. Install restrained joints mechanism in accordance with manufacturer's recommendations.
      b. Examine and clean mechanism; remove dirt, debris and other foreign material.
      c. Apply gasket and joint NSF 61 FDA food grade approved lubricant.
      d. Verify gasket is evenly seated.
      e. Do not over stab pipe into mechanism.
   2. Prevent any lateral movement of thrust restraints throughout pressure testing and operation.

C. All bends, tees, valves, and plugs shall have thrust blocks installed in accordance with the details on the plans. Thrust blocking will be installed such that joints will be accessible for inspection and repair. Concrete used in thrust blocking shall have a compressive strength of at least 3,000 psi and conform to the requirements of Section 32 13 13 Concrete Paving.

3.09 HYDROSTATIC TESTING OF WATER LINES

A. After the pipe has been laid and initial backfill completed, the water line shall be subjected to a hydrostatic test per AWWA C600 or AWWA C605 at a minimum pressure of 150 psi. Joints shall remain exposed during testing whenever possible.

B. The Contractor shall furnish, install, and operate, at his expense, the necessary connections, pumps, meters, and gauges necessary to conduct the test. The meters used in the testing shall be tested, sealed and approved at the Contractor's expense prior to running any test.

C. Procedure
1. Where practicable, pipelines shall be tested in lengths between valves or plugs of no more than 1,500 feet. Contractor must have written approval for test sections greater than 1,500 feet.
2. Minimum duration of testing for each section shall be 2 hours when joints are exposed and 8 hours when joints are covered.
3. Allowable leakage shall be as calculated by the following formula:
$L=(S)(D)(P^{.05})/133,200$
L= Allowable leakage in gallons per hour
S=Length of Pipe in Feet
D=Inside diameter of pipe in inches
P=Pressure in pounds per square inch
4. Correct defects, cracks, or leakage by replacement of defective items. All visible leaks at exposed joints and all leaks evident on the surface where joints are covered shall be replaced, regardless of total leakage shown.
5. Repeat test until satisfactory results are obtained.
6. Upon satisfactory completion of testing, remove risers remaining from disinfection and hydrostatic testing, and backfill excavation promptly.

3.10 DISINFECTION OF WATER LINES

A. Promptly disinfect water lines after approved completion of the hydrostatic tests.

B. Contractor shall pay for and provide water for disinfection and flushing.

C. Contractor will conduct disinfection operations.

D. Coordinate chlorination operations with the authority having jurisdiction and the Owner’s Representative.

E. Provide temporary blind flanges, cast-iron sleeves, plugs, necessary service taps, copper service leads, risers and jumpers of sizes, location and materials, and other items needed to facilitate disinfection of new water lines prior to connection to the existing water distribution system. Normally, each valved section of water line requires two each 3/4-inch taps. A 2-inch minimum blow-off is required for water lines up to and including 6-inch diameter.

F. Use fire hydrants as blow-offs to flush newly constructed water lines 6 inch diameters and above. Where fire hydrants are not available on water lines, install temporary blow-off valves as approved by the Owner’s Representative and remove promptly upon successful completion of disinfection and testing.

G. Slowly fill each section of pipe with water in manner approved by Owner’s Representative. Average water velocity when filling pipeline should be less than one foot per second and shall not, under any circumstance, exceed 2 feet per second. Before beginning disinfection operations, expel air from pipeline.

H. Backfill excavations immediately after installation of risers or blow-offs.

I. Install blow-off valves at end of water line to facilitate flushing of dead-end water lines. Install permanent blow-off valves according to drawings.

J. Procedure
1. Use not less than 100 parts of chlorine per million parts of water.
2. Introduce chlorinating material to water lines in accordance with AWWA C 651.

3. After contact period of not less than 24 hours, flush system with clean water until residual chlorine is no greater than 1.0 parts per million parts of water.
4. Open and close valves in lines being sterilized several times during contact period.
5. After disinfection and flushing of water lines, the Contractor shall have bacteriological tests performed by an approved testing laboratory. When test results indicate need for additional disinfection of water lines based upon Texas Commission on Environmental Quality and/or Texas Department of Health requirements, provide additional disinfection operations.
6. Upon satisfactory completion of testing, remove temporary risers remaining disinfection and hydrostatic testing, and backfill excavation promptly.

END OF SECTION 33 10 00

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SECTION 33 30 00 – SANITARY SEWER

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for furnishing and placing sanitary sewer pipe, laterals, stubs, and appurtenances. The pipe shall be of the size, type and location, and to the lines, grades and elevations shown on the plans and constructed in accordance with these specifications.

1.02 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.03 REGULATORY REQUIREMENTS

A. Contractor shall comply with all current, applicable codes and regulations.
   1. Contractor shall comply with requirements of utility company receiving waste water. Include tapping of existing structures or service lines.
   2. Contractor shall comply with standards of authorities having jurisdiction for sanitary sewer piping, including materials, installation and testing.

B. Contractor shall comply with all Standard Specifications and Details of Authorities having Jurisdiction (herein after referred to as "Standard Specifications") for work in the right-of-way or easements.

C. Install sewer lines to meet minimum separation distance from potable water line, as shown in the drawings. Separation distance is defined as distance between outside of water pipe and outside of sewer pipe. When possible, install new sanitary sewers no closer to water lines than 9 feet in all directions. Where this separation distance cannot be achieved, new sanitary sewers shall be installed as shown in the drawings.

D. Prior to commencement of work, the Contractor shall be responsible for obtaining, at the Contractor’s own expense, all construction permits necessary to complete the project according to the plans and specifications.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

C. Field quality-control test reports.

1.05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Contractor is responsible for protecting materials per manufactures recommendations
   1. Do not store plastic manholes, pipe, and fittings in direct sunlight.
   2. Protect pipe, pipe fittings, and seals from dirt and damage.
   3. Handle precast structures according to manufacturer's written rigging instructions.

C. Install sanitary sewer that is watertight both in pipe-to-pipe joints and in pipe to-manhole connections.

PART 2 – PRODUCTS

2.01 PVC PIPE

A. PVC pipe for gravity sanitary sewers shall conform to ASTM D3034, SDR 26. All diameters shall use bell and spigot ends for gasketed joints. For sewers up to 12" diameter crossing over or under waterlines, provide minimum 150 psi pressure-rated pipe conforming to ASTM D2241 with suitable PVC couplings.

B. PVC pipe for sanitary sewer force mains shall conform to ASTM D2241, SDR 21 or AWWA C 900, DR 18 and provide a minimum pressure rating of 150 psi. Pipe shall be green in color.

C. Gaskets shall meet requirements of ASTM F 477. Use elastomeric factory-installed gaskets to make joints flexible and watertight.

D. Do not use PVC in potentially or known contaminated areas.

E. Do not use PVC in areas exposed to direct sunlight.

F. Make curves and bends by bending the pipe, do not exceed maximum limits of curvature recommended by pipe manufacturer. Submit details of other methods of providing curves and bends for review by the Owner's Representative.

2.02 DUCTILE IRON PIPE

A. Ductile iron pipe for gravity sanitary sewers shall conform to ASTM A746, thickness Class 50, pressure rated for 150 PSI unless otherwise indicated on the plans. Pipe shall be lined with 20 mils of epoxy extending from plain or beveled end to rear of gasket socket. The exterior of the pipe shall have a bituminous coating approximately one mil in thickness.

B. Ductile iron pipe for sanitary sewer force mains shall conform to ASTM C151, thickness Class 50, pressure rated for 150 PSI. Pipe shall be lined with 20 mils of epoxy extending from plain or beveled end to rear of gasket socket. The exterior of the pipe shall have a bituminous coating approximately one mil in thickness.

C. Gaskets shall conform to AWWA C111, rubber.

D. All ductile iron pipe and fittings shall be wrapped with polyethylene per AWWA C 105.

2.03 JOINTS

A. PVC pipe joints shall conform to ASTM D3212 with a SDR matching the pipe.

B. Ductile iron pipe joints shall be push-on type unless otherwise indicated on the plans.

2.04 MANHOLES

A. Precast concrete manholes in accordance with the details shown on the Drawings shall conform to ASTM C-478.

B. Cast-in-Place-Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated. The minimum compressive strength of concrete manhole shall be 4,000 psi.

C. Ballast: Increase thickness of concrete as required to prevent flotation.

D. Resilient Pipe Connectors: ASTM C 923 cast or fitted into manhole walls, for each pipe connection.

E. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.

F. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.

G. All manholes shall have stainless steel manhole inserts (inflow preventers).

2.05 MORTAR

A. Mortar for construction of the bench and invert in all manholes shall conform to ASTM C 476.

2.06 CLEANOUTS

A. Cleanouts in accordance with the details shown on the Drawings shall consist of PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.07 RIMS, GRATES AND FRAMES

A. Castings for manhole rims, covers and frames shall conform to ASTM A 48, Class 35B gray iron or better quality.

2.08 FITTINGS

A. Fittings shall be mechanical joint conforming to AWWA C153 lined with 20 mils of epoxy extending from plain or beveled end to rear of gasket socket. The exterior of the fitting shall have a bituminous coating approximately one mil in thickness.

B. Gaskets shall conform to AWWA C111, rubber.

C. All ductile iron fittings shall be wrapped with polyethylene per AWWA C 105.

2.09 MANUFACTURERS

A. Use approved American manufacturers.

PART 3 – EXECUTION

3.01 PREPERATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage and displacement.

B. Verify all existing utilities prior to beginning construction. Inform the Owner's Representative if existing utilities are not as shown in the plans.

C. Perform work in accordance with OSHA standards.

D. Sewer service to the site or adjacent landowners shall not be shut down without prior approval of the Owner's Representative and the authority having jurisdiction. At no additional cost to the Owner the Contractor shall install necessary piping and accessories so as not to disrupt service outside to other facilities or landowners whether or not indicated on the plans.

E. Confirm that nine feet minimum separation from water lines and accessories. Where above clearances cannot be attained, provide protection per the requirements of this Section and obtain additional instructions as required from the Owner's Representative before proceeding with construction.

F. Before installation, inspect each pipe, fitting and structure for defects. Reject defective, damaged or unsound pipe, fittings or structures and remove them from site.

3.02 GENERAL

A. No pipe shall be installed in the trench until excavation has been properly constructed per the plans and details to at least two (2) pipe lengths beyond the section of pipe being installed and the bottom of the trench has been properly shaped.

B. Pipe shall be so laid that after the sewer is completed the interior surface shall conform accurately to the grades and alignments fixed and given in the Plans.

C. All sewers must be laid accurately to line and grade, with tongue or spigot end downstream. Establish required uniform line and grade in trench from benchmarks identified by the Owner's Representative. Use laser beam equipment to establish and maintain proper line and grade of work.

D. Pipes shall be fitted together and matched so that when laid, they form a sewer with a smooth and uniform invert.

E. A minimum clearance of twelve (12) inches must be maintained between the sewer and all other lines. Sanitary sewers shall not be routed over water lines.

F. Where conditions are such that running or standing water occurs in the trench bottom or the soil in the trench bottom displays a "quick" tendency, the water shall be removed by pumps and suitable means such as well points or pervious underdrain bedding until the pipe has been installed and the backfill has been placed to a sufficient height to prevent pipe flotation. Care should be taken that any underdrain is of proper gradation and thickness to prevent migration of material between the underdrain, pipe embedment and native soils in the trench below and at the sides of the pipe.

G. Do not allow sand, debris, runoff or other foreign materials to enter sewer system.

3.03 DIVERSION PUMPING

A. Install and operate required bulkheads, plugs, piping, and diversion pumping equipment to maintain sewage flow and to prevent backup or overflow. Obtain approval for diversion pumping equipment and procedures from the Owner's Representative.

B. Design piping, joints and accessories to withstand twice maximum system pressure or 50 psi, whichever is greater.

C. In event of accidental spill or overflow, immediately stop overflow and take action to clean up and disinfect spillage and promptly notify the Owner's Representative.

3.04 EARTHWORK

A. Conform to applicable provisions of Section 31 23 33 Trenching, Backfilling and Compaction.

B. Backfill excavated areas in same day excavated. When not possible, cover excavated areas using steel plates on paved areas and other protective measures elsewhere.

C. Place material in uniform layers of prescribed maximum loose thickness and wet or dry material to approximately optimum moisture content. Compact to prescribed density Water tamping is not allowed.

D. When trenches exceed five feet in depth Contractor shall utilize trench safety measures per Section 31 41 33 Trench Safety.

3.05 PIPE CUTTING

A. Cut pipe 12 inches and smaller with standard wheel pipe cutters. Cut pipe larger than 12 inches in manner approved by the Owner's Representative. Make cuts smooth and at right angles to axis of pipe. Bevel plain end with heavy file or grinder to remove sharp edges.

3.06 PIPE INSTALLATION BY OPEN CUT

A. Install pipe in accordance with pipe manufacturer's recommendations and as specified in following paragraphs.

B. Install pipe only after excavation is completed, bottom of trench fine graded, bedding material is installed.

C. Install pipe to line and grade indicated. Place pipe so that it has continuous bearing of barrel on bedding material and is laid in trench so interior surfaces of pipe follow grades and alignment indicated. Provide bell holes where necessary.

D. Form concentric joint with each section of adjoining pipe so as to prevent offsets.

E. Keep interior of pipe clean as installation progresses. Remove foreign material and debris from pipe.

F. Provide lubricant, place and drive home newly laid sections so as to eliminate damage to sections. Install pipe to "home" mark where provided.

G. Keep excavations free of water during construction and until final inspection.

H. When work is not in progress, cover exposed ends of pipes with approved plug to prevent foreign material from entering pipe.

I. Where gravity sanitary sewer is to be installed under existing water line with separation distance of at least 2 feet and less than 9 feet, install new sewer pipe so that one full 20 foot long pipe is centered on water line crossing. Embed sewer pipe in cement stabilized sand for minimum distance of 10 feet on each side of crossing.

J. Where gravity sanitary sewer is to be installed under existing water line with separation distance of less than 2 feet, install new sewer using pressure-rated pipe as shown on Drawings. Maintain minimum 1 foot separation distance.

3.07 PIPE INSTALLATION OTHER THAN OPEN CUT

A. Contractor shall utilize methods of pipe installation other than open cut as shown on the Drawings or as otherwise required to install the sewer.

B. Pipe shall be of the size, type, and class specified on the Plans, or other types as may be specified by the Engineer or designated on the Plans.

C. Jacking
1. If the grade of the pipe at the jacking end is below the ground surface, suitable pits or trenches shall be excavated for the purpose of conducting the jacking operations and for placing end joints of the pipe. Wherever end trenches are cut in the sides of the embankment or beyond it, such work shall be sheeted securely and braced in a manner satisfactory to the Owner’s Representative to prevent earth caving.
2. Where pipe is required to be installed under railroad embankments or under highways, streets, or other facilities by jacking or boring methods, construction shall be made in such a manner that will not interfere with the operation of the railroad, street, highway, or other facility, and shall not weaken or damage any embankment or structure. During construction operations, barricades and lights to safeguard traffic and pedestrians shall be furnished and maintained, as directed by the Owner’s Representative, until such time as the backfill has been completed and then shall be removed from the site.
3. Heavy duty jacks suitable for forcing the pipe through the embankment shall be provided. In operating jacks, even pressure shall be applied to all jacks used. A suitable jacking head, usually of timber, and suitable bracing between jacks and jacking head shall be provided so that pressure will be applied to the pipe uniformly around the ring of the pipe. A suitable jacking frame or back stop shall be provided. The pipe to be jacked shall be set on guides, properly braced together, to support the section of the pipe and to direct it in the proper line and grade. The whole jacking assembly shall be placed so as to line up with the direction and grade of the pipe. In general, embankment material shall be excavated just ahead of the pipe and material removed through the pipe, and the pipe forced through the embankment with jacks, into the space thus provided.
4. The Contractor shall furnish for the Owner’s Representative’s review, a plan showing his proposed method of handling, including the design for the jacking head, jacking support of back stop, arrangement and position of jacks, pipe guides, etc., complete in assembled position. The review of this plan by the Owner’s Representative’s will not relieve the Contractor from his responsibility to obtain the specified results.

5. The excavation for the underside of the pipe, for at least one third of the circumference of the pipe, shall conform to the contour and grade of the pipe. A clearance of not more than two inches (2") may be provided for the upper half of the pipe. This clearance is to be tapered off to zero at the point where the excavation conforms to the contour of the pipe. The distance that the excavation shall extend beyond the end of the pipe depends on the character of the material, but it shall not exceed two feet (2') in any case. This distance shall be decreased on instructions from the Engineer, if the character of the material being excavated makes it desirable to keep the advance excavation closer to the end of the pipe.
6. The pipe, preferably, shall be jacked from the low or downstream end. Lateral or vertical variation in the final position of the pipe from the line and grade established will be permitted at the discretion of the Owner's Representative provided that such variation shall be regular, only in one direction and that the final grade of flow line shall be in the direction indicated on the plans.
7. If the Contractor desires, he may use a cutting edge of steel plate around the head end of the pipe extending a short distance beyond the end of the pipe with inside angles or lugs to keep the cutting edge from slipping back onto pipe.
8. When jacking of pipe is once begun, the operation shall be carried on without interruption, insofar as practicable, to prevent the pipe from becoming firmly set in the embankment.
9. Any pipe damaged in jacking operations shall be removed and replaced by the Contractor at no additional cost to the Owner.
10. The pits or trenches excavated to facilitate jacking operations shall be backfilled in accordance with the details for backfilling sewer lines shown in the Drawings immediately after the jacking of the pipe has been completed.

D. Boring
1. The boring shall proceed from a pit provided for the boring equipment and workmen. Excavation for pits and installation of shoring shall be as outlined above under 3.5.C. The location of the pit shall meet the approval of the Owner's Representative. The holes are to be bored mechanically. The boring shall be done using a pilot hole. By this method approximately a two inch (2") pilot hole shall be bored the entire length of the crossing and shall be checked for line and grade on the opposite end of the bore from the work pit.
2. This pilot hole shall serve as the centerline of the larger diameter hole to be bored. Excavated material will be placed near the top of the working pit and disposed of as required. The use of water or other fluids in connection with the boring operation will be permitted only to the extent to lubricate cuttings. Jetting will not be permitted.
3. In unconsolidated soil formations a gel forming colloidal drilling fluid consisting of at least 10% of high grade carefully processed bentonite may be used to consolidate cuttings of the bit, seal the walls of the hole, and furnish lubrication for subsequent removal of cuttings and installation of the pipe immediately thereafter.
4. Allowable variation from line and grade shall be as specified under 3.5.C. above. Over cutting in excess of one inch (1") shall be remedied by pressure grouting the entire length of the installation.

3.08 MANHOLES

A. Manholes shall be constructed at locations shown on the plans and to the depth indicated thereon.

B. Manholes shall be constructed to the dimensions shown on the plans. Where concrete or precast concrete sections are used, the interior wall shall be coated with 80 mils thickness Raven 405.

C. Joints between precast concrete sections shall be made by uniformly placing "Ram-Nek" flexible plastic gaskets or approved equal on all faces of the lower part of the joint and lowering the upper ring evenly into place to produce uniform bearing and compression on the sealer.

D. The construction of manholes shall be done as soon as practical after sewer lines into or through the manhole are completed.

E. All sewers shall be cut neatly at the inside face of the walls of the manhole and pointed up with mortar.

F. After the masonry work has been completed to the proper elevation, the cast iron manhole cover frame shall be set in a full mortar bed and adjusted to the elevation established on the drawings.

G. The inverts of the sewer line or several sewer lines entering the manhole at or near the flow line elevation of the manhole shall be shaped and routed across the floor of the manhole using mortar to obtain the proper contour.

H. When sanitary sewer pipes enter a manhole two (2) feet or greater above the bottom of the manhole, a drop pipe of equal diameter shall be constructed outside the manhole to the bottom of the manhole per the details on the plans.

I. All Manholes are to be backfilled per the details shown in the Drawings and the requirements of Section 31 23 33 – Trenching, Backfill and Compaction.

3.09 FRAMES, GRATES, RINGS AND COVERS

A. Casting shall conform to the type shown on the Drawings and shall be clean castings, free from sand or blow holes or other defects. Materials shall be not less than Class 30B gray iron conforming to ASTM A-48.

B. Surfaces of the castings shall be free from burnt-on sand and shall be reasonably smooth.

C. Bearing surfaces between manhole rings and covers and frames shall be cast or machined with such precision that uniform bearing shall be provided throughout the perimeter area of contact.

3.10 INSPECTION AND TESTING OF GRAVITY SANITARY SEWERS

A. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

B. Do not put into service before inspection and approval.

C. Test completed piping systems according to requirements of this section and authorities having jurisdiction.

D. Schedule tests and inspections by the Owner's Representative and authorities having jurisdiction with at least 48 hours' advance notice.

E. Submit separate report for each test.

F. Sanitary Sewer Cleaning and Television Inspection
   1. Cleaning:
      a. Take precautions to protect sanitary sewer mains and manholes from damage that might be inflicted by the improper selection of cleaning processes or improper use of equipment. When using hydraulically-propelled devices take precautions to ensure that the water pressure created does not cause damage to or flooding of public or private property. Do not surcharge any sanitary sewer to an elevation that could cause overflow of sewage into area waterways, homes or buildings, or onto the surface.
      b. Exercise care to prevent contamination of the potable water system. Use an appropriately sized backflow preventer as required by the authority having jurisdiction when drawing water from a public hydrant.
      c. Debris Disposal: Remove sludge, soil, sand, rocks, grease, roots and other solid or semi-solid material resulting from the cleaning operation at the downstream manhole of the section being cleaned. Passing debris from any sewer section to any other sewer section is not allowed. Load debris from the manholes into an enclosed container permitted for liquid waste hauling. Remove solids and semi-solids resulting from cleaning operations from the site and dispose of lawfully at the end of each work day. Do not accumulate debris, liquid waste, or sludge on the site.
   2. Television Inspection
      a. Immediately after cleaning, video inspect the sanitary sewer line to document the condition of the line. Notify the Owner's Representative 48 hours in advance of any television inspection so that they may observe inspection operations.

b. Perform television inspection on one manhole section at a time. Adequately control the flow in the section being inspected. No flow is allowed in the line while performing post-installation video inspection.
c. Perform television inspection of sanitary sewers as follows:
d. Videos shall pan all manholes showing benches, walls, annular spaces, and debris removal. Camera operator shall slowly pan each service connection, clamped joint and pipe material transition from one material to another. Complete and submit a Television Inspection Report for every sewer segment video submitted to the Owner's Representative.
e. Provide a video showing the completed work including the condition of any service connections. Prepare and submit Television Inspection Report forms providing the location of service connections along with the location of any discrepancies.
f. Document results of video inspections using a Television Inspection Report form approved by the Owner's Representative.

G. Sanitary Sewer Deflection Testing
1. Perform deflection testing on flexible and semi-rigid pipe to confirm pipe has no more than 5 percent deflection. Mandrel testing shall conform to ASTM D 3034. Perform testing no sooner than 30 days after backfilling of line segment, but prior to final acceptance testing of line segment.
2. Rigid mandrel shall have outside diameter (O.D.) equal to 95 percent of inside diameter (I.D.) of pipe. Mandrel shall be constructed of metal or rigid plastic material that can withstand 200 psi without being deformed. Mandrel shall have nine or more "runners" or "legs" as long as total number of legs is odd number. Barrel section of mandrel shall have length of at least 75 percent of inside diameter of pipe. Rigid mandrel shall not have adjustable or collapsible legs which would allow reduction in mandrel diameter during testing.
3. Pull approved mandrel by hand through sewer sections. Mandrel testing is not required for stubs.
4. Document results of deflection testing using a Sanitary Sewer Deflection Test Report form approved by the Owner's Representative.

H. Sanitary Sewer Leakage Testing
1. Low Air Pressure Test: When using this test conform to ASTM C 828, ASTM C 924, or ASTM F 1417, as applicable, with holding time not less than that listed below.
a. Low Pressure Air testing for sections of pipe shall be limited to lines less than 36-inch average inside diameter.
b. Lines 36-inch average inside diameter and larger shall be tested at each joint. Minimum time allowable for pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch during joint test shall be 10 seconds, regardless of pipe size.
c. Time Allowed for Pressure Loss from 3.5 psig to 2.5 psig, at end of this Section, are based on equation from Texas Commission on Environmental Quality (TCEQ) Design Criteria.

	$T = 0.0850(D)(K)/(Q)$
T =	time for pressure to drop 1.0 pounds per square inch gauge in seconds
K =	0.000419 DL, but not less than 1.0
D =	average inside diameter in inches
L =	length of line of same pipe size in feet
Q =	rate of loss, 0.0015 ft^3/min./sq. ft. internal surface

d. Since K value of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as given below.
e. For joint test, pipe is to be pressurized to 3.5 psi greater than pressure exerted by groundwater above pipe. Once pressure has stabilized, minimum times allowable for pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be 10 seconds.
f. Document results of low pressure air test using a Sanitary Sewer Low Pressure Air Test Report form approved by the Owner's Representative.

Notes:
- When two sizes of pipe are involved, compute time by ratio of lengths involved.
- Lines with 27-inch average inside diameter and larger may be air tested at each joint.

- Lines with average inside diameter greater than 36 inches must be air tested for leakage at each joint.
- If joint test is used, perform visual inspection of joint immediately after testing.

I. Sanitary Manhole Vacuum Testing
1. After completion of manhole construction, wall sealing, or rehabilitation, but prior to backfilling, test manholes for water tightness using hydrostatic or vacuum testing procedures.
2. Plug influent and effluent lines, including service lines, with suitably-sized pneumatic or mechanical plugs. Ensure plugs are properly rated for pressures required for test; follow manufacturer's safety and installation recommendations. Place plugs minimum of 6 inches outside of manhole walls. Brace inverts to prevent lines from being dislodged when lines entering manhole have not been backfilled.
3. Install vacuum tester head assembly at top access point of manhole and adjust for proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to recommended maximum inflation pressure; do not over-inflate.
4. Evacuate manhole with vacuum pump to 10 inches mercury (Hg), disconnect pump, and monitor vacuum for time period specified below.
5. A manhole passes the test if after 2.0 minutes and with all valves closed, the vacuum is at least 9.0 inches of mercury (Hg).
6. Document results of vacuum testing using a Sanitary Sewer Manhole Vacuum Test Report form approved by the Owner’s Representative.

3.11 INSPECTION AND TESTING OF SANITARY SEWER FORCE MAINS

A. Hydrostatic Testing
1. After the pipe has been laid and initial backfill completed, the water line shall be subjected to a hydrostatic test per AWWA C600 or AWWA C605 at a minimum pressure of 150 psi. Joints shall remain exposed during testing whenever possible.
2. The Contractor shall furnish, install, and operate, at his expense, the necessary connections, pumps, meters, and gauges necessary to conduct the test. The meters used in the testing shall be tested, sealed and approved at the Contractor's expense prior to running any test.
3. Where practicable, pipelines shall be tested in lengths between valves or plugs of no more than 1,500 feet. Contractor must have written approval for test sections greater than 1,500 feet.
4. Minimum duration of testing for each section shall be 2 hours when joints are exposed and 8 hours when joints are covered.
5. Allowable leakage shall be as calculated by the following formula:
   L=(S)(D) (P.05)/133,200
   L= Allowable leakage in gallons per hour
   S=Length of Pipe in Feet
   D=Inside diameter of pipe in inches
   P=Pressure in pounds per square inch
6. Correct defects, cracks, or leakage by replacement of defective items. All visible leaks at exposed joints and all leaks evident on the surface where joints are covered shall be replaced, regardless of total leakage shown.
7. Repeat test until satisfactory results are obtained.
8. Upon satisfactory completion of testing, plug openings in force main. Use cast iron plugs or blind flanges to prevent debris from entering tested pipeline.

B. Pigging Test
1. After completion of hydrostatic testing and prior to final acceptance, test force mains longer than 200 feet by pigging to ensure piping is free of obstructions.
2. Pigs: Provide proving pigs manufactured of open-cell polyurethane foam body, without coating or abrasives which would scratch or otherwise damage interior pipe wall surface or lining. Pigs shall be able to pass through reductions of up to 65 percent of nominal cross-sectional area of pipe. Pigs shall be able to pass through standard fittings such as 45-degree and 90-degree elbows, crosses, tees, wyes, gate valves, or plug valves, as applicable to force main being tested.

END OF SECTION 33 30 00

SECTION 33 40 00 – STORM DRAINAGE

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the requirements for furnishing and placing drainage pipe, laterals, stubs, and appurtenances. The pipe shall be of the size, type and location, and to the lines, grades and elevations shown on the plans and constructed in accordance with these specifications.

1.02 DEFINITIONS

A. CMP: Corrugated metal pipe.

B. HDPE: High-density polyethylene plastic.

C. PVC: Polyvinyl chloride plastic.

D. RCB: Reinforced concrete box.

E. RCP: Reinforced concrete pipe.

1.03 REGULATORY REQUIREMENTS

A. Contractor shall comply with standards of authorities having jurisdiction for drainage piping, including materials, installation and testing.

B. Contractor shall comply with all Standard Specifications and Details of Authorities having Jurisdiction (herein after referred to as "Standard Specifications") for work in the right-of-way or easements.

C. Prior to commencement of work, the Contractor shall be responsible for obtaining, at the Contractor’s own expense, all construction permits necessary to complete the project according to the plans and specifications.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

C. Field quality-control test reports.

1.05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Contractor is responsible for protecting materials per manufactures recommendations
   1. Do not store plastic manholes, pipe, and fittings in direct sunlight.
   2. Protect pipe, pipe fittings, and seals from dirt and damage.
   3. Handle precast structures according to manufacturer's written rigging instructions.

C. Install drainage system that is watertight both in pipe-to-pipe joints and in pipe to-manhole connections.

PART 2 – PRODUCTS

2.01 CMP PIPE

A. Corrugated metal pipe shall be galvanized steel conforming to the requirements of AASHTO M 218

1. Reference to gauge of metal is to U.S. Standard Gauge for uncoated sheets. Tables in AASHTO M 218 list thicknesses for coated sheets in inches.

B. Coupling bands and other hardware for galvanized steel pipe shall conform to requirements of AASHTO M 36.
   1. Coupling bands shall be not more than 3 nominal sheet thicknesses lighter than thickness of pipe to be connected and in no case lighter than 0.052 inch.
   2. Coupling bands shall be made of same base metal and coating (metallic or otherwise) as pipe.
   3. Minimum width of corrugated locking bands shall be as shown below for corrugations which correspond to end circumferential corrugations on pipes being joined:
      a. 10-1/2 inches wide for 2-2/3 inch by 1/2 inch corrugations.
      b. 12 inches wide for 3 inch by 1 inch corrugations.
   4. Helical pipe without circumferential end corrugations will be permitted only when it is necessary to join new pipe to existing pipe which was installed with no circumferential end corrugations. In this event pipe furnished with helical corrugations at ends shall be field jointed with either helically corrugated bands or with bands with projections (dimples). Minimum width of helical corrugated bands shall conform to following:
      a. 12 inches wide for 1/2 inch deep helical end corrugations.
      b. 14 inches wide for 1 inch deep helical end corrugations.
   5. Bands with projections shall have circumferential rows of projections with one projection for each corrugation. Width of bands with projections shall be not less than following:
      a. 12 inches wide for pipe diameters up to and including 72 inches. Bands shall have two circumferential rows of projections.
      b. 16-1/4 inches wide for pipe diameters of 78 inches and greater. Bands shall have four circumferential rows of projections.
   6. Bolts for coupling bands shall be 1/2 inch diameter. Bands 12 inches wide or less will have minimum of 2 bolts per end at each connection, and bands greater than 12 inches wide shall have minimum of 3 bolts at each connection.
   7. Galvanized bolts may be hot dip galvanized in accordance with requirements of AASHTO M 232, mechanically galvanized to provide same requirements as AASHTO M 232, or electro galvanized per ASTM B 633, Type RS.

C. Furnish fittings and specials required for bends, end sections, branches, access manholes, and connections to other fittings. Design fittings and specials in accordance with Drawings and ASTM A 760. Fittings and specials are subject to same internal and external loads as straight pipe.

D. Fabrication
   1. Steel Pipe:
      a. Galvanized steel pipe shall be full circle or arch pipe conforming to AASHTO M 36, Type I, Type IA, or Type II, as indicated on Drawings.
      b. Fabrication with circumferential corrugations, lap joint construction with riveted or spotwelded seams, helical corrugations with continuous helical lock seam, or ultra-high frequency resistance butt-welded seams is acceptable.

2.02 HDPE PIPE

A. Furnish annular corrugated profile wall polyethylene pipe conforming to ASTM F2648 for gravity storm sewer and storm sewer culvert pipe. Joints shall be installed such that connection of pipe sections will form continuous line free from irregularities in flow line.

B. Joints
   1. Integral Bell and Spigot. Bell shall overlap minimum of two corrugations of spigot end when fully engaged.
   2. Shall be watertight according to the requirements of ASTM D3212.

C. Gaskets shall meet requirements of ASTM F 477. Use gasket molded into circular form or extruded to proper section and then spliced into circular form. When no contaminant is identified, use gaskets of properly cured,

high-grade elastomeric compound. Basic polymer shall be natural rubber, synthetic elastomer, or blend of both.

D. Fittings shall conform to ASTM F2306.

E. Perforated pipe shall conform to the requirements of ASTM M252 for pipe diameters 3-inch through 10-inch and ASTM M294 for pipe diameters 12-inch through 60-inch.

2.03 PVC PIPE

A. PVC pipe shall conform to ASTM D3034, SDR 26. All diameters shall use bell and spigot ends for gasketed joints.

B. Joints shall conform to ASTM D3212 with a SDR matching the pipe.

C. Gaskets shall meet requirements of ASTM F 477. Use elastomeric factory-installed gaskets to make joints flexible and watertight.

D. Fittings shall conform to ASTM D3034.

E. Do not use PVC in potentially or known contaminated areas.

F. Do not use PVC in areas exposed to direct sunlight.

G. Make curves and bends by bending the pipe, do not exceed maximum limits of curvature recommended by pipe manufacturer. Submit details of other methods of providing curves and bends for review by the Owner's Representative.

2.04 RCP PIPE

A. Reinforced concrete pipe shall conform to requirements of ASTM C-76, wall "B" thickness for, Class III and Class IV as shown on the plans or as necessary to meet ASTM cover design requirements.

B. Reinforced concrete arch pipe shall conform to requirements of ASTM C 506 for Class A-III. Joints shall conform to ASTM C 877.

C. Reinforced concrete elliptical pipe, either vertical or horizontal, shall conform to requirements of ASTM C 507 for Class VE-III for vertical or Class HE-III for horizontal. Use rubber gasket joints conforming to ASTM C 877.

D. Gaskets shall conform to AWWA C111, rubber.

E. Gaskets
   1. When no contaminant is identified, furnish rubber gasket conforming to ASTM C 443 for circular reinforced concrete pipe and rubber gasket conforming to ASTM C 877 for reinforced concrete elliptical pipe.
   2. Use gaskets as recommended by pipe manufacturer and approved by the Owner's Representative prior to installation in potentially contaminated soil.

2.05 RCB PIPE

A. Reinforced concrete boxes shall conform to requirements of ASTM C1577.

2.06 MANHOLES

A. Precast concrete manholes in accordance with the details shown on the Drawings shall conform to ASTM C-478.

B. Cast-in-Place-Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated. The minimum compressive strength of concrete manhole shall be 4,000 psi.

C. Ballast: Increase thickness of concrete as required to prevent flotation.

D. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.

E. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.

2.07 PRECAST CONCRETE INLETS, HEADWALLS AND WINGWALLS

A. Provide precast concrete machine-made units meeting requirements of ASTM C 76 regarding reinforced concrete, cement, aggregate, mixture, and concrete test. Minimum 28-day compressive strength of concrete shall be 4,000 psi.

B. Reinforcing Steel shall conform to requirements of ASTM A615, Grade 60.

C. Mark date of manufacture and name or trademark of manufacturer clearly on inside of inlet, headwall, or wingwall.

2.08 PVC INLETS

A. PVC surface drainage inlets shall include the drain basin type as indicated on the drawings. The ductile iron grates for each of these fittings are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer.

B. PVC inlets shall be manufactured from PVC pipe stock, utilizing a thermoforming process to reform the pipe stock to the specified configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The flexible elastomeric seals shall conform to ASTM F477. The pipe bell spigot shall be joined to the main body of the drain basin or catch basin. The raw material used to manufacture the pipe stock that is used to manufacture the main body and pipe stubs of the surface drainage inlets shall conform to ASTM D1784 cell class 12454.

C. The grates and frames furnished for all PVC inlets shall be ductile iron and shall be made specifically for each basin so as to provide a round bottom flange that closely matches the diameter of the inlet. Grates for drain basins shall be capable of supporting H-20 wheel loads. Ductile iron used in the manufacture of the castings shall conform to ASTM A536 grade 70-50-05. Grates and covers shall be provided painted black.

2.09 MORTAR

A. Mortar shall conform to ASTM C 476.

2.10 CLEANOUTS

A. Cleanouts in accordance with the details shown on the Drawings shall consist of PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.11 RIMS, GRATES AND FRAMES

A. Castings for manhole and inlet rims, covers, grates and frames shall conform to ASTM A 48, Class 35B gray iron or better quality.

2.12 MANUFACTURERS

A. Use approved American manufacturers.

PART 3 – EXECUTION

3.01 PREPERATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage and displacement.

B. Verify all existing utilities prior to beginning construction. Inform the Owner's Representative if existing utilities are not as shown in the plans.

C. Perform work in accordance with OSHA standards.

D. Drainage to the site and adjacent landowners shall not be obstructed without prior approval of the Owner's Representative and the authority having jurisdiction. At no additional cost to the Owner the Contractor shall install necessary piping and accessories so as not to disrupt drainage from other facilities or landowners whether or not indicated on the plans.

E. Before installation, inspect each pipe, fitting and structure for defects. Reject defective, damaged or unsound pipe, fittings or structures and remove them from site.

3.02 GENERAL

A. No pipe shall be installed in the trench until excavation has been properly constructed per the plans and details to at least two (2) pipe lengths beyond the section of pipe being installed and the bottom of the trench has been properly shaped.

B. Pipe shall be so laid that after the sewer is completed the interior surface shall conform accurately to the grades and alignments fixed and given in the Plans.

C. All sewers must be laid accurately to line and grade, with tongue or spigot end downstream. Establish required uniform line and grade in trench from benchmarks identified by the Owner's Representative. Use laser beam equipment to establish and maintain proper line and grade of work.

D. Pipes shall be fitted together and matched so that when laid, they form a sewer with a smooth and uniform invert.

E. A minimum clearance of twelve (12) inches must be maintained between the drainage system and all other lines.

F. Outfall pipes shall be as detailed on the drawings and conform to the requirements of the authority having jurisdiction.

G. Where conditions are such that running or standing water occurs in the trench bottom or the soil in the trench bottom displays a "quick" tendency, the water shall be removed by pumps and suitable means such as well points or pervious underdrain bedding until the pipe has been installed and the backfill has been placed to a sufficient height to prevent pipe flotation. Care should be taken that any underdrain is of proper gradation and thickness to prevent migration of material between the underdrain, pipe embedment and native soils in the trench below and at the sides of the pipe.

H. Do not allow sand, debris, runoff or other foreign materials to enter sewer system.

3.03 EARTHWORK

A. Conform to applicable provisions of Section 31 23 33 Trenching, Backfilling and Compaction.

B. Backfill excavated areas in same day excavated. When not possible, cover excavated areas using steel plates on paved areas and other protective measures elsewhere.

C. Place material in uniform layers of prescribed maximum loose thickness and wet or dry material to approximately optimum moisture content. Compact to prescribed density Water tamping is not allowed.

D. When trenches exceed five feet in depth Contractor shall utilize trench safety measures per Section 31 41 33 Trench Safety.

3.04 PIPE CUTTING

A. Cut pipe 12 inches and smaller with standard wheel pipe cutters. Cut pipe larger than 12 inches in manner approved by the Owner's Representative. Make cuts smooth and at right angles to axis of pipe. Bevel plain end with heavy file or grinder to remove sharp edges.

3.05 PIPE INSTALLATION BY OPEN CUT

A. Install pipe in accordance with pipe manufacturer's recommendations and as specified in following paragraphs.

B. Install pipe only after excavation is completed, bottom of trench fine graded, bedding material is installed.

C. Install pipe to line and grade indicated. Place pipe so that it has continuous bearing of barrel on bedding material and is laid in trench so interior surfaces of pipe follow grades and alignment indicated. Provide bell holes where necessary.

D. Form concentric joint with each section of adjoining pipe so as to prevent offsets.

E. Keep interior of pipe clean as installation progresses. Remove foreign material and debris from pipe.

F. Provide lubricant, place and drive home newly laid sections so as to eliminate damage to sections. Install pipe to "home" mark where provided.

G. Keep excavations free of water during construction and until final inspection.

H. When work is not in progress, cover exposed ends of pipes with approved plug to prevent foreign material from entering pipe.

3.06 PIPE INSTALLATION OTHER THAN OPEN CUT

A. Contractor shall utilize methods of pipe installation other than open cut as shown on the Drawings or as otherwise required to install the sewer.

B. Pipe shall be of the size, type, and class specified on the Plans, or other types as may be specified by the Engineer or designated on the Plans.

C. Jacking
1. If the grade of the pipe at the jacking end is below the ground surface, suitable pits or trenches shall be excavated for the purpose of conducting the jacking operations and for placing end joints of the pipe. Wherever end trenches are cut in the sides of the embankment or beyond it, such work shall be sheeted securely and braced in a manner satisfactory to the Owner's Representative to prevent earth caving.
2. Where pipe is required to be installed under railroad embankments or under highways, streets, or other facilities by jacking or boring methods, construction shall be made in such a manner that will not interfere with the operation of the railroad, street, highway, or other facility, and shall not weaken or damage any embankment or structure. During construction operations, barricades and lights to safeguard traffic and pedestrians shall be furnished and maintained, as directed by the Owner's Representative, until such time as the backfill has been completed and then shall be removed from the site.

3. Heavy duty jacks suitable for forcing the pipe through the embankment shall be provided. In operating jacks, even pressure shall be applied to all jacks used. A suitable jacking head, usually of timber, and suitable bracing between jacks and jacking head shall be provided so that pressure will be applied to the pipe uniformly around the ring of the pipe. A suitable jacking frame or back stop shall be provided. The pipe to be jacked shall be set on guides, properly braced together, to support the section of the pipe and to direct it in the proper line and grade. The whole jacking assembly shall be placed so as to line up with the direction and grade of the pipe. In general, embankment material shall be excavated just ahead of the pipe and material removed through the pipe, and the pipe forced through the embankment with jacks, into the space thus provided.
4. The Contractor shall furnish for the Owner's Representative's review, a plan showing his proposed method of handling, including the design for the jacking head, jacking support of back stop, arrangement and position of jacks, pipe guides, etc., complete in assembled position. The review of this plan by the Owner's Representative's will not relieve the Contractor from his responsibility to obtain the specified results.
5. The excavation for the underside of the pipe, for at least one third of the circumference of the pipe, shall conform to the contour and grade of the pipe. A clearance of not more than two inches (2") may be provided for the upper half of the pipe. This clearance is to be tapered off to zero at the point where the excavation conforms to the contour of the pipe. The distance that the excavation shall extend beyond the end of the pipe depends on the character of the material, but it shall not exceed two feet (2') in any case. This distance shall be decreased on instructions from the Engineer, if the character of the material being excavated makes it desirable to keep the advance excavation closer to the end of the pipe.
6. The pipe, preferably, shall be jacked from the low or downstream end. Lateral or vertical variation in the final position of the pipe from the line and grade established will be permitted at the discretion of the Owner's Representative provided that such variation shall be regular, only in one direction and that the final grade of flow line shall be in the direction indicated on the plans.
7. If the Contractor desires, he may use a cutting edge of steel plate around the head end of the pipe extending a short distance beyond the end of the pipe with inside angles or lugs to keep the cutting edge from slipping back onto pipe.
8. When jacking of pipe is once begun, the operation shall be carried on without interruption, insofar as practicable, to prevent the pipe from becoming firmly set in the embankment.
9. Any pipe damaged in jacking operations shall be removed and replaced by the Contractor at no additional cost to the Owner.
10. The pits or trenches excavated to facilitate jacking operations shall be backfilled in accordance with the details for backfilling sewer lines shown in the Drawings immediately after the jacking of the pipe has been completed.

D. Boring
1. The boring shall proceed from a pit provided for the boring equipment and workmen. Excavation for pits and installation of shoring shall be as outlined above under 3.5.C. The location of the pit shall meet the approval of the Owner's Representative. The holes are to be bored mechanically. The boring shall be done using a pilot hole. By this method approximately a two inch (2") pilot hole shall be bored the entire length of the crossing and shall be checked for line and grade on the opposite end of the bore from the work pit.
2. This pilot hole shall serve as the centerline of the larger diameter hole to be bored. Excavated material will be placed near the top of the working pit and disposed of as required. The use of water or other fluids in connection with the boring operation will be permitted only to the extent to lubricate cuttings. Jetting will not be permitted.
3. In unconsolidated soil formations a gel forming colloidal drilling fluid consisting of at least 10% of high grade carefully processed bentonite may be used to consolidate cuttings of the bit, seal the walls of the hole, and furnish lubrication for subsequent removal of cuttings and installation of the pipe immediately thereafter.
4. Allowable variation from line and grade shall be as specified under 3.5.C. above. Over cutting in excess of one inch (1") shall be remedied by pressure grouting the entire length of the installation.

3.07 MANHOLES, INLETS, JUNCTION BOXES AND OTHER STRUCTURES

A. Structures shall be constructed in accordance with the details shown on plans at locations shown on the plans and to the depth indicated thereon.

B. Joints between precast concrete sections shall be made by uniformly placing "Ram-Nek" flexible plastic gaskets or approved equal on all faces of the lower part of the joint and lowering the upper ring evenly into place to produce uniform bearing and compression on the sealer.

C. The construction of structures shall be done as soon as practical after sewer lines into or through the manhole are completed.

D. All sewers shall be cut neatly at the inside face of the walls of the manhole and pointed up with mortar.

E. After the masonry work has been completed to the proper elevation, the cast iron manhole cover frame shall be set in a full mortar bed and adjusted to the elevation established on the drawings.

F. All Manholes are to be backfilled per the details shown in the Drawings and the requirements of Section 31 23 33 – Trenching, Backfill and Compaction.

3.08 FRAMES, GRATES, RINGS AND COVERS

A. Casting shall conform to the type shown on the Drawings and shall be clean castings, free from sand or blow holes or other defects. Materials shall be not less than Class 30B gray iron conforming to ASTM A-48.

B. Surfaces of the castings shall be free from burnt-on sand and shall be reasonably smooth.

C. Bearing surfaces between manhole rings and covers and frames shall be cast or machined with such precision that uniform bearing shall be provided throughout the perimeter area of contact.

3.09 UNDERDRAIN SYSTEM

A. Pipe shall be laid per paragraph 3.1 and per the details on the plans.

B. Prior to placing granular backfill and bedding, line trench with drainage fabric according to the details.

C. Granular bedding shall be prepared to a depth of 2 to 4 inches below the pipe invert. The pipe shall be laid with the perforations facing down. The granular backfill shall then be placed to the depth shown on the details. The filter fabric shall then be wrapped around the granular material with a minimum overlap at the top of 6 inches.

D. Where vertical pipe risers penetrate the granular backfill to the surface, the drainage fabric shall be cut in an 'X' to accommodate the pipe penetration and then the fabric shall be sealed with a heavy duty tape to the pipe in the manner to insure the integrity of the filter fabric.

3.10 CLEANING AND INSPECTION

A. Clean and inspect new piping systems, and parts of existing systems that have been altered, extended, repaired, or otherwise impacted by the construction.

B. Schedule cleaning and inspections by the Owner’s Representative and authorities having jurisdiction with at least 48 hours' advance notice.

C. Cleaning:
1. Take precautions to protect storm sewer mains and structures from damage that might be inflicted by the improper selection of cleaning processes or improper use of equipment. When using hydraulically-propelled devices take precautions to ensure that the water pressure created does not cause damage to or flooding of public or private property.
2. Exercise care to prevent contamination of the potable water system. Use an appropriately sized backflow preventer as required by the authority having jurisdiction when drawing water from a public hydrant.
3. Debris Disposal: Remove soil, sand, rocks, construction debris and other solid or semi-solid material resulting from the cleaning operation at the downstream structure of the section being cleaned. Passing debris from any section to any other section is not allowed. Load debris from the structures

into an enclosed container permitted for waste hauling. Remove solids and semi-solids resulting from cleaning operations from the site and dispose of lawfully at the end of each work day. Do not accumulate debris or liquid waste on the site.

D. Inspect all structures and interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

E. Repair or replace defective piping or structures as required by the Owner's Representative and repeat inspections until results are satisfactory.

END OF SECTION 33 40 00

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